Service
Manual

Biomedical freezer

MDF-U333
MDF-U537
MDF-U537D

SANYO Electric Biomedical Co., Ltd.

MDF-U537

SM7210139

Effective models

This service manual is effective following models.

Model name	Model code	Voltage and Frequency
MDF-U537	823 168 51	115V 60Hz
	823 168 52	220V 50Hz
	823 168 53	220V 60Hz
	823 168 54	230V 50Hz
	823 168 55	240V 50Hz
	823 168 56	115V 60Hz
	823 168 57	110V 60Hz
	824 168 58	230V 50Hz
	824 168 59	220V 50Hz
	824 168 60	240V 50Hz
	825 168 61	
	825 168 62	
MDF-U537D	823 169 51	115V 60Hz
	823 169 52	220V 50Hz
	823 169 53	220V 60Hz
	823 169 54	230V 50Hz
	827 169 55	240V 50Hz
	823 169 56	240V 50Hz
	823 169 57	230V 50Hz
	823 169 58	115V 60Hz
	823 169 59	110V 60Hz
	823 169 60	220V 50Hz
	823 169 61	
	823 169 62	
MDF-U333	823 170 51	115V 60Hz
	823 170 52	220V 50Hz
	823 170 53	220V 60Hz
	823 170 54	230V 50Hz
	823 170 55	240V 50Hz
	823 170 56	110V 60Hz
	823 170 57	230V 50Hz
	823 170 58	240V 50Hz
	823 170 59	220V 50Hz
	823 170 60	
	823 170 61	
	823 170 62	

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Features

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■ HFC refrigerant

Refrigerant circuit contains HFC refrigerant that effect to environment little.
Latest cooling system reduces negative factor to global environment. With ambient temperature at 35℃, while temperature of inside chamber maintains -30℃.

■ PCM structure

PCM structure reduces amount of organic solvent.

■ Temperature control function

Unified temperature control range for same categories realized to set -20℃, which is suitable for reagent preservation.

■ Specification unified

Unified specification for same categories, which also realized to unify performance for high/low temperature alarm (SV is changeable in the range ±5～±15℃), power failure alarm, remote alarm terminal, setting memorization by non-volatile memory.
Adopt new microprocessor system for display panel and keypad makes operation easily.

■ Self diagnosis function

Abnormal condition for temperature sensor is indicated by self-diagnosis system.

■ Validation

Control panel enables zero “0” adjust for validation.

■ New door latch mechanism

New door latch is adopted in order to close door surely for reagents.
It is also available to use individual lock mechanism.

■ Insulation wall thickness

Unit has necessary insulation performance for each temperature range.
Combination of PCM and frame form makes 610mm for frame size commonly.

■ Option

Internal temperature observation system is option.
Unit has communication function corresponding to it.

Features

<MDF－U537, 537D>

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Control panel enables zero “0” adjust for validation.

■ New door latch mechanism

New door latch is adopted in order to close door surely for reagents.
It is also available to use individual lock mechanism.

■ Draw box for reagent preservation

100mm for depth of box makes things easily to arrange and take in & out.
(Adopted in bottom chamber of MDF-U537/U537D)

■ Compressor protection function

Sensor detects compressor’s warming up to control unit running.

Specification

MDF-U333

Items		Specification
Model description		Biomedical freezer
Model Number		MDF-U333
Outer dimension (Max)		W 614 × D 733 × H 1620 mm
Inner dimension		W 490 × D 485 × H 1290 mm
Effective chamber capacity		274 lit.
Exterior		Zinc galvanized steel w/powder polyester coating (PCM)
Interior		Polystyrene resin
Insulation		Rigid polyurethane foam
Outer door		1 pc, Zinc galvanized steel w/powder polyester coating (PCM)
Latch		1 pc
Door lock		1 pc
Accessories	Basket	(L) 4 pcs Inner dimension: $^{W}446 \times {}^{D}369 \times {}^{H}220$ mm
		(S) 1 pc (for bottom column) Inner dimension: $^{W}487 \times {}^{D}221 \times {}^{H}155$mm
	Others	Defrosting spatula 1 pc, key 1 set, 4 card holders
Caster		4 pcs
Leveling legs		2 pcs (with caster)
Access hole		ϕ 30mm. 1 place in left side.
Weights		81 Kg
Evaporator		Tube on sheet type (function both evaporator and shelf)
Condenser		Wire and tube type
Compressor		Hermetic type 225W
Refrigerant		HFC refrigerant R-134a
Cooling performance		-30℃ (internal 1/2h air temperature, AT：35℃, no load)
Internal temperature control range		-20℃~-30℃ (AT：5℃~35℃、no load)
Power supply		Local voltage

MDF-U333

Items		Specification
Temperature controller		Microprocessor controlled system with non-volatilized memory. Temp. set range : -18℃～-40℃
Temperature sensor		Thermistor
Temperature display		LED digital display (green colored) by 1℃. Range : -50℃～50℃
Alarm	High/Low Temperature	Changeable SV±5℃～15℃. (Initial SV±10℃) ALARM lamp brinks and buzzer sounds intermittently (about 15 min. delay) Remote alarm contact: turns ON during power failure alarm.
	Power failure	ALARM lamp brinks, buzzer sounds intermittently, remote alarm contact turns ON during power failure alarm.
	Remote alarm contact	Remote alarm terminal 3P: contact capacity DC30v, Max2A, N.O. –COM. (During power failure, temperature alarm: ON)
Operation panel	Control panel	ALARM lamp BUZZER: Buzzer key ALARM TEST: Alarm test key SET: To switch the SV and PV ＞: To shift the set digit ∧: To change the SV DEF: Defrost key
	Rear	Power switch (Breaker switch) Battery switch: Power failure alarm switch
Key lock function		Press ＞ key for five seconds L0: Unlock L1: Lock
Self diagnosis function		When each sensor is in fault, Error code and internal temperature are displayed alternately. Remote alarm contact turns ON with buzzer sounds.
Power switch		Breaker switch
Compressor protection		Overload relay
Option		Chart recorder: MTR-G85 Mounting kit: MPR-S7(for bottom mounting) : MDF-S740T(for top mounting)

Specification

MDF-U537

Items		Specification
Model description		Biomedical freezer
Model Number		MDF-U537
Outer dimension (Max)		W 804 × D 772 × H 1802 mm
Inner dimension		W 658 × D 607 × H 1272 mm
Effective chamber capacity		482 lit.
Exterior		Zinc galvanized steel w/powder polyester coating (PCM)
Interior		Polystyrene resin
Insulation		Rigid polyurethane foam
Outer door		Zinc galvanized steel w/powder polyester coating (PCM) 2 pcs (upper and lower compartment)
Latch		2 pcs
Door lock		1 pc
Accessories	Basket	(M) 6 pcs (upper compartment) Inner dimension: $^{W}290 \times ^{D}536 \times ^{H}136$ mm
		(S) 8 pcs (lower compartment) Inner dimension: $^{W}290 \times ^{D}536 \times ^{H}100$mm
	Others	Defrosting spatula 1 pc, key 1 set, 14 card holders
Caster		4 pcs
Leveling legs		2 pcs (with caster)
Access hole		ϕ 30mm. 1 place on rear.
Weights		131 Kg
Evaporator		Tube on sheet type (function both evaporator and shelf)
Condenser		Wire and tube type
Compressor		Hermetic type 350W
Refrigerant		HFC refrigerant R-407D
Cooling performance		-30℃ (internal 1/2h air temperature, AT：35℃, no load)
Internal temperature control range		-20℃~-30℃ (AT：5℃~35℃、no load)
Power supply		Local voltage

MDF-U537

Items		Specification
Temperature controller		Microprocessor controlled system with non-volatilized memory. Temp. set range : -18℃～-40℃
Temperature sensor		Thermistor 2P
Temperature display		LED digital display (green colored) by 1℃. Range : -50℃～50℃
Alarm	High/Low Temperature	Changeable SV±5℃～15℃. (Initial SV±10℃) ALARM lamp brinks and buzzer sounds intermittently (about 15 min. delay) Remote alarm contact: turns ON during power failure alarm.
	Power failure	ALARM lamp brinks, buzzer sounds intermittently, remote alarm contact turns ON during power failure alarm.
	Remote alarm contact	Remote alarm terminal 3P: contact capacity DC30v, 2A, N.O. –COM. (During power failure, temperature alarm: ON)
Operation panel	Control panel	ALARM lamp BUZZER: Buzzer key ALARM TEST: Alarm test key SET: To switch the SV and PV ＞: To shift the set digit ∧: To change the SV DEF: Defrost key
	Rear	Power switch (Breaker switch) Battery switch: Power failure alarm switch
Key lock function		Press ＞ key for five seconds L0: Unlock L1: Lock
Self diagnosis function		When each sensor is in fault, Error code and internal temperature are displayed alternately. Remote alarm contact turns ON with buzzer sounds.
Power switch		Breaker switch
Compressor protection		Overload relay Detect temperature near compressor by thermistor sensor to control compressor during overload. Alarm: Error code and internal temperature are displayed alternately. Remote alarm contact turns on with buzzer sounds.
Option		Chart recorder: MTR-G85 Mounting kit: MPR-S7(for bottom mounting) : MDF-S740T(for top mounting)

Specification

MDF-U537D

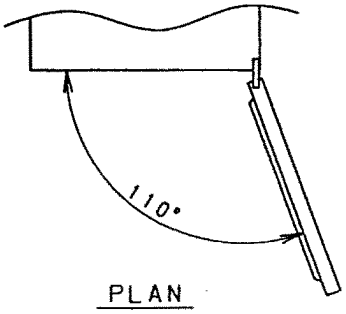
Items		Specification
Model description		Biomedical freezer
Model Number		MDF-U537D
Outer dimension (Max)		W 804 × D 772 × H 1802 mm
Inner dimension		Upper chamber W 658 × D 607 × H 589 mm Lower chamber W 658 × D 607 × H 603 mm
Effective chamber capacity		452 lit.
Exterior		Zinc galvanized steel w/powder polyester coating (PCM)
Interior		Polystyrene resin
Insulation		Rigid polyurethane foam
Outer door		Zinc galvanized steel w/powder polyester coating (PCM) 2 pcs (upper and lower compartment)
Latch		2 pcs
Door lock		1 pc
Accessories	Basket	(M) 6 pcs (upper compartment) Inner dimension: $^{W}290 \times ^{D}536 \times ^{H}136$ mm
		(S) 8 pcs (lower compartment) Inner dimension: $^{W}290 \times ^{D}536 \times ^{H}100$mm
	Others	Defrosting spatula 1 pc, key 1 set, 14 card holders
Caster		4 pcs
Leveling legs		2 pcs (with caster)
Access hole		ϕ 30mm. 2 places on rear.
Weights		136 Kg
Evaporator		Tube on sheet type (function both evaporator and shelf)
Condenser		Wire and tube type
Compressor		Hermetic type 350W
Refrigerant		HFC refrigerant R-407D
Cooling performance		-30℃ (internal 1/2h air temperature, AT：35℃, no load)
Internal temperature control range		-20℃~-30℃ (AT：5℃~35℃、no load)
Power supply		Local voltage

MDF-U537D

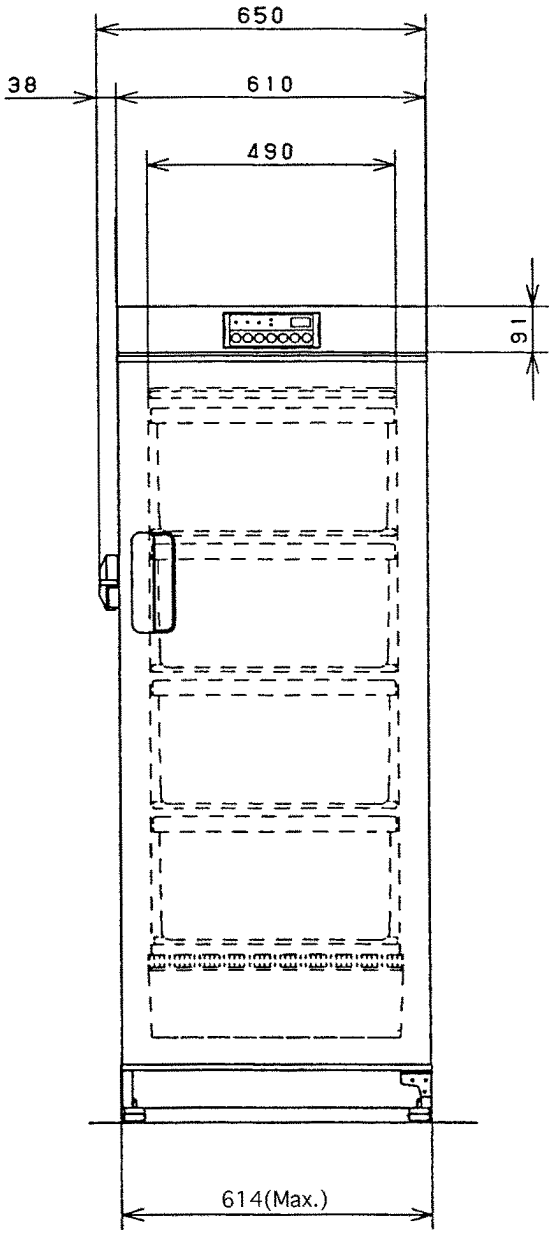
Items		Specification
Temperature controller		Microprocessor controlled system with non-volatilized memory. Temp. set range : -18℃～-40℃
Temperature sensor		Thermistor 2P (upper and lower compartment)
Temperature display		LED digital display (green colored) by 1℃. Range : -50℃～50℃
		Selectable to display upper or lower compartment by switch.
Alarm	High/Low Temperature	Changeable SV±5℃～15℃. (Initial SV±10℃) ALARM lamp brinks and buzzer sounds intermittently (about 15 min. delay) Remote alarm contact: turns ON during power failure alarm.
	Power failure	ALARM lamp brinks, buzzer sounds intermittently, remote alarm contact turns ON during power failure alarm.
	Remote alarm contact	Remote alarm terminal 3P: contact capacity DC30v, 2A, N.O. –COM. (During power failure, temperature alarm: ON)
Operation panel	Control panel	ALARM lamp BUZZER: Buzzer key ALARM TEST: Alarm test key SET: To switch the SV and PV ＞: To shift the set digit ∧: To change the SV DEF: Defrost key TOP/BOTTOM: Switch key to display upper or lower compartment.
	Rear	Power switch (Breaker switch) Battery switch: Power failure alarm switch
Key lock function		Press ＞ key for five seconds L0: Unlock L1: Lock
Self diagnosis function		When each sensor is in fault, Error code and internal temperature are displayed alternately. Remote alarm contact turns ON with buzzer sounds.
Power switch		Breaker switch
Compressor protection		Overload relay Detect temperature near compressor by thermistor sensor to control compressor during overload. Alarm: Error code and internal temperature are displayed alternately. Remote alarm contact turns on with buzzer sounds.
Option		Chart recorder: MTR-G85 Mounting kit: MPR-S7(for bottom mounting) : MDF-S740T(for top mounting)

Dimensions

<MDF-U333>



PLAN



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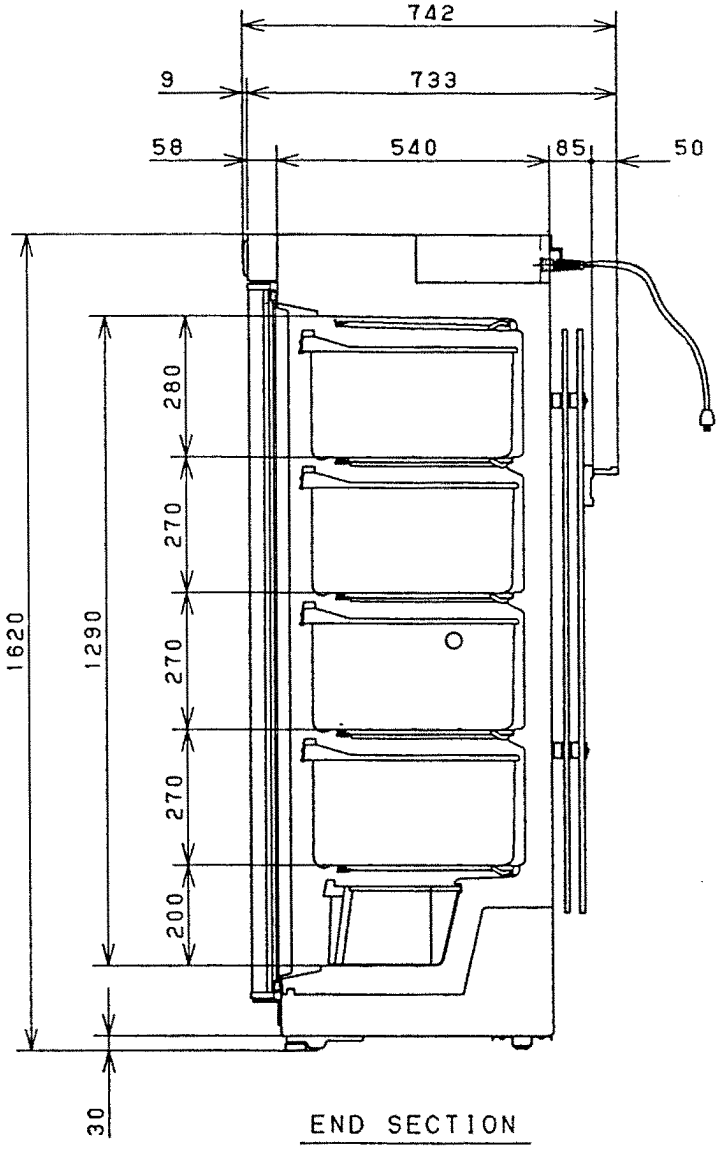

END SECTION

Dimensions

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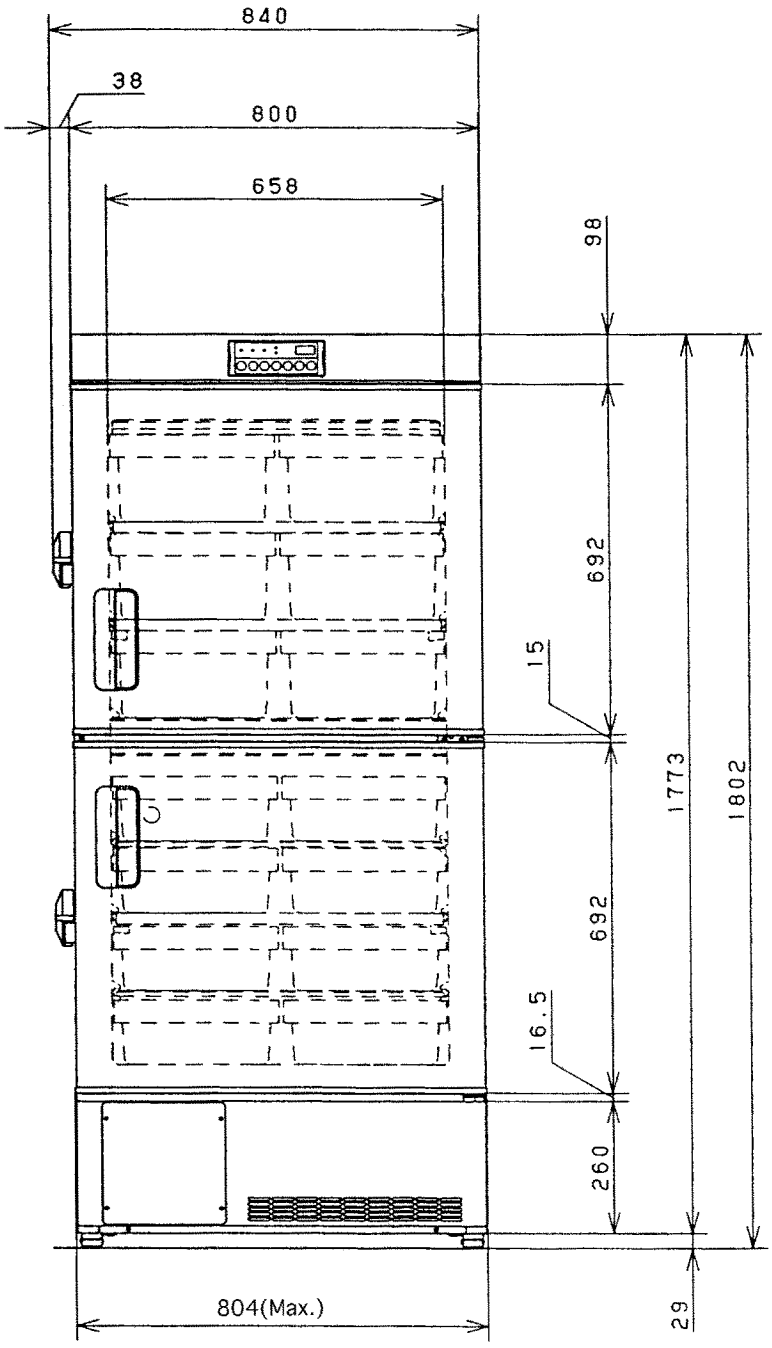

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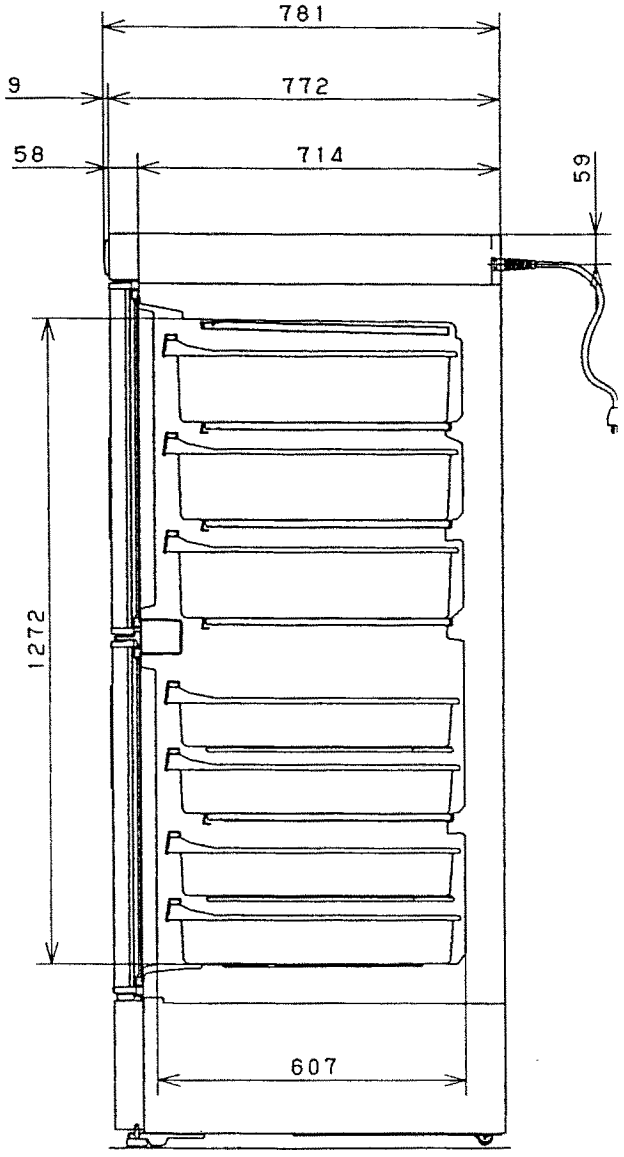
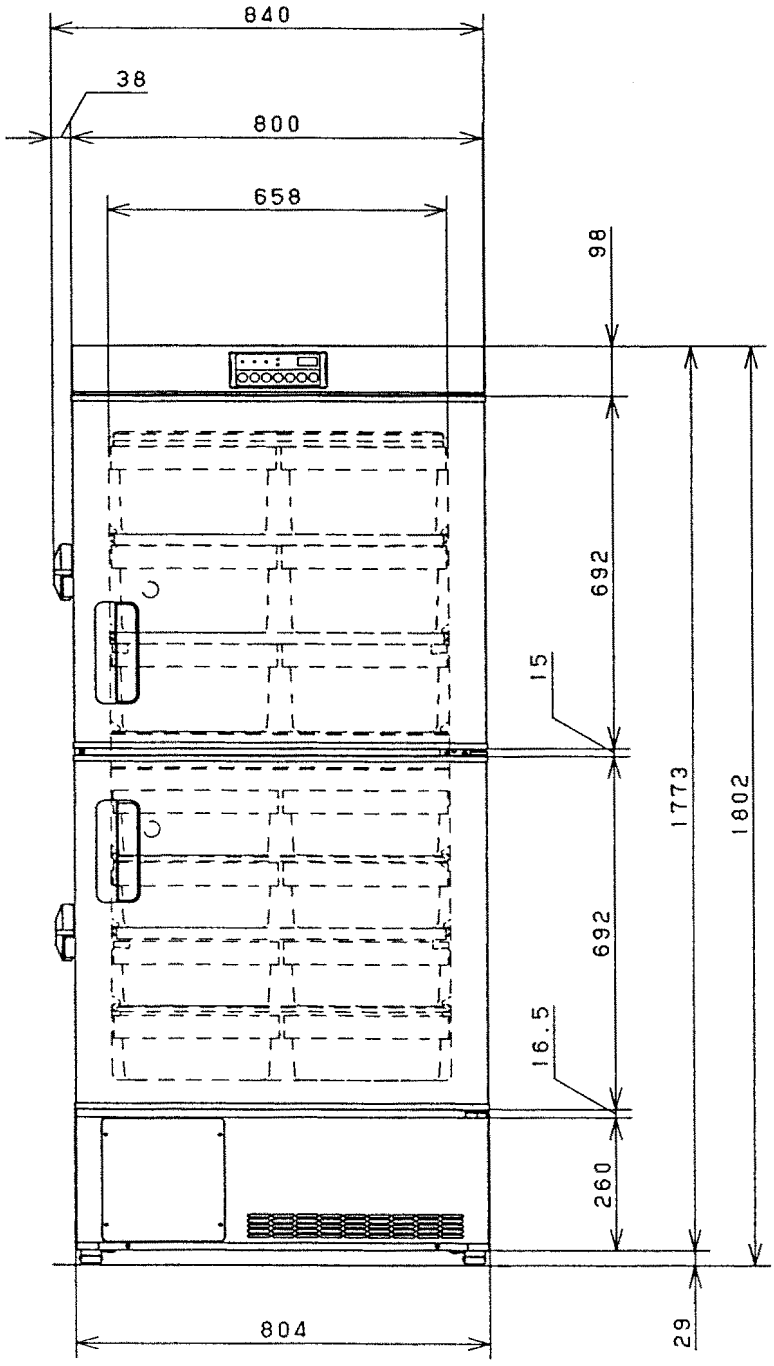


END SECTION

Dimensions

＜MDF-U537D＞



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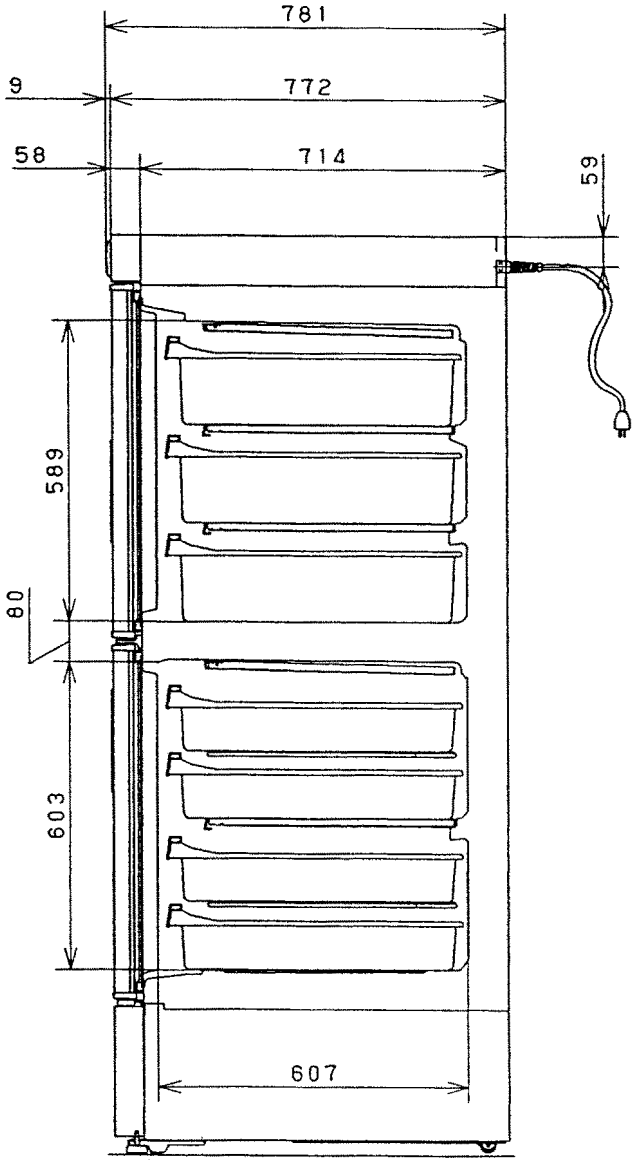


END SECTION

Refrigeration circuit

MDF-U333 Unit：mm

Parts description	Specification	
Evaporator	Type	Tube on sheet
	Material	Aluminum (ϕ 8.0)
Dehydrator	Type of molecular sieves	4A-XH9（134 stamped）
	Charged q'ty	8±1g
Capillary tube	Resistance	0.686MPaG （7Kgf／㎠G）
	Dimension	ϕ 1.8×(ϕ 0.65)×2000mm
	Resistance indicator color	White
Condenser assembly A	Type	Wire and tube
	Dimension	$^{W}480\times{}^{P}40\times30$ columns
Condenser assembly B	Type	Wire and tube
	Dimension	$^{W}480\times{}^{P}40\times30$ columns Note: Lower 2 columns are used in desuper circuit.
Frame pipe	Material	C1220T-1/2H
	Dimension	ϕ 4.0×^{t}0.5
Evacuation and vacuum pressure	Evacuation time: over than 20min. by 2 ports (high pressure and low pressure side). (N2 exchange) When charged, vacuum pressure is lower than 1.0torr （pump capacity：300L/min）	
Refrigerant and oil	Refrigerant： R-134a Charged q'ty： 226±5g	
	Oil： CF－32 Charged q'ty： 230±10cc	
	Oil additive: n-pentane Charged q'ty： 14g	
Refrigeration circuit spec. and welding points	Refer to following pages	

Refrigeration circuit

MDF-U537 Unit：mm

Parts description	Specification	
Evaporator **Upper (1)** **Lower (1)** **Bottom (3)**	Type	9lines × 1column × 5pcs
	Material	Aluminum (ϕ 8.0)
Dry core	Type	D-S032T
	Manufacturer	SANYO
	Solid core	50cm^3
Capillary tube **(Total number: 2)**	Resistance	0.725MPaG （7.4Kgf／㎠ G）
	Dimension	ϕ 1.8 × ^{L}4500
	Resistance indicator color	Blue
Condenser assembly front (Total number: 4)	Type	Wire and tube
	Dimension	^{W}480 × ^{P}40 × 6 columns
Frame pipe	Material	C1220T
	Dimension	ϕ 4.0 × ^{t}0.5 × ^{L}7470
Evacuation and vacuum pressure	Evacuation time: over than 20min. by 2 ports (high pressure and low pressure side). (N2 exchange) When charged, vacuum pressure is lower than 1.0torr （pump capacity：300L/min）	
Refrigerant and oil	Refrigerant： R-407D	Charged q'ty： 301±5g
	Oil： CF－32	Charged q'ty : 280±10cc
	Oil additive: n-pentane	Charged q'ty: 19g
Refrigeration circuit spec. and welding points	Refer to following pages	

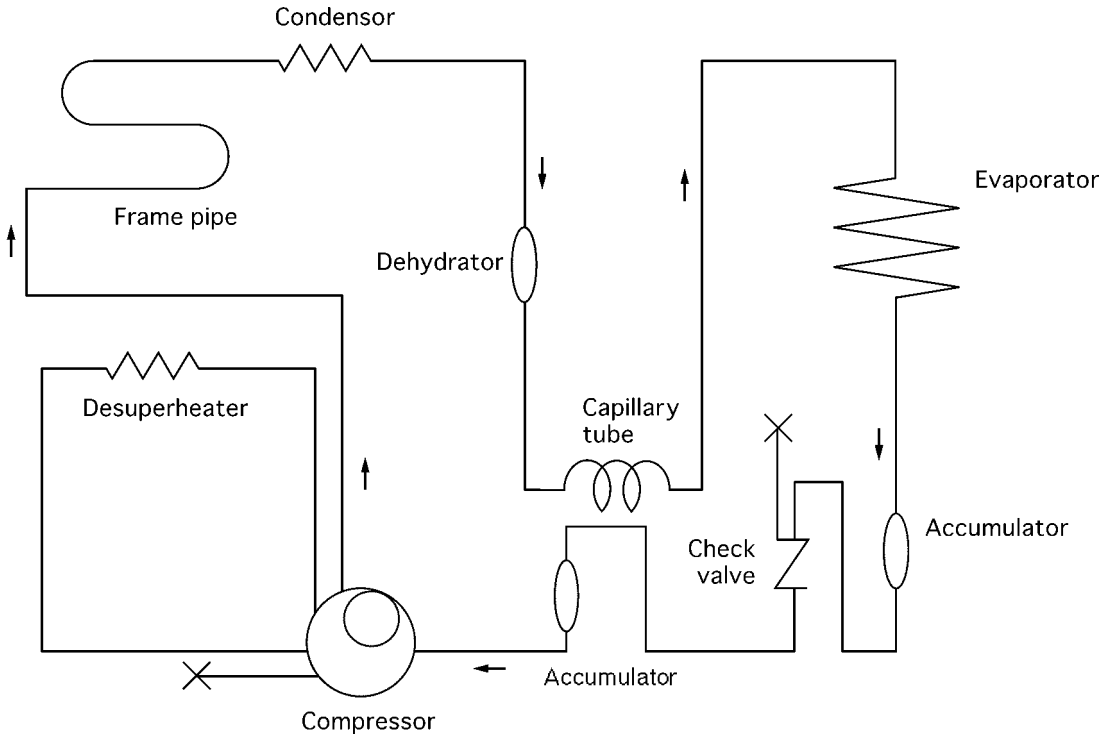
Refrigeration circuit

MDF-U537D Unit：mm

Parts description	Specification		
Evaporator assembly **Upper (1)** **Lower (1)** **Bottom (2)** **Lower entrance (1)**	Type	9lines × 1column × 5pcs	
	Material	Aluminum (ϕ 8.0)	
Dry core	Type	D-S032T	
	Manufacturer	SANYO	
	Solid core	50cm^3	
Capillary tube		Upper compartmnt	Lower compartmnt
	Resistance	10.3Kg/㎠ G	9.9Kg/㎠ G
	Dimension	ϕ 1.8 × ^{L}4000	ϕ 1.8 × ^{L}3000
	Resistance indicator color	Yellow	Red
Condenser assembly front (Total number: 4)	Type	Wire and tube	
	Dimension	^{W}480 × ^{P}40 × 6 columns	
Frame pipe	Material	C1220T	
	Dimension	ϕ 4.0 × ^{t}0.5 × ^{L}7470	
Evacuation and vacuum pressure	Evacuation time: over than 20min. by 2 ports (high pressure and low pressure side). (N2 exchange) When charged, vacuum pressure is lower than 1.0torr （pump capacity：300L/min）		
Refrigerant and oil	Refrigerant： R-407D	Charged q'ty： 357±5g	
	Oil： CF－32	Charged q'ty： 280±10cc	
	Oil additive： n-pentane	Charged q'ty： 23g	
Refrigeration circuit spec. and welding points	Refer to following pages		

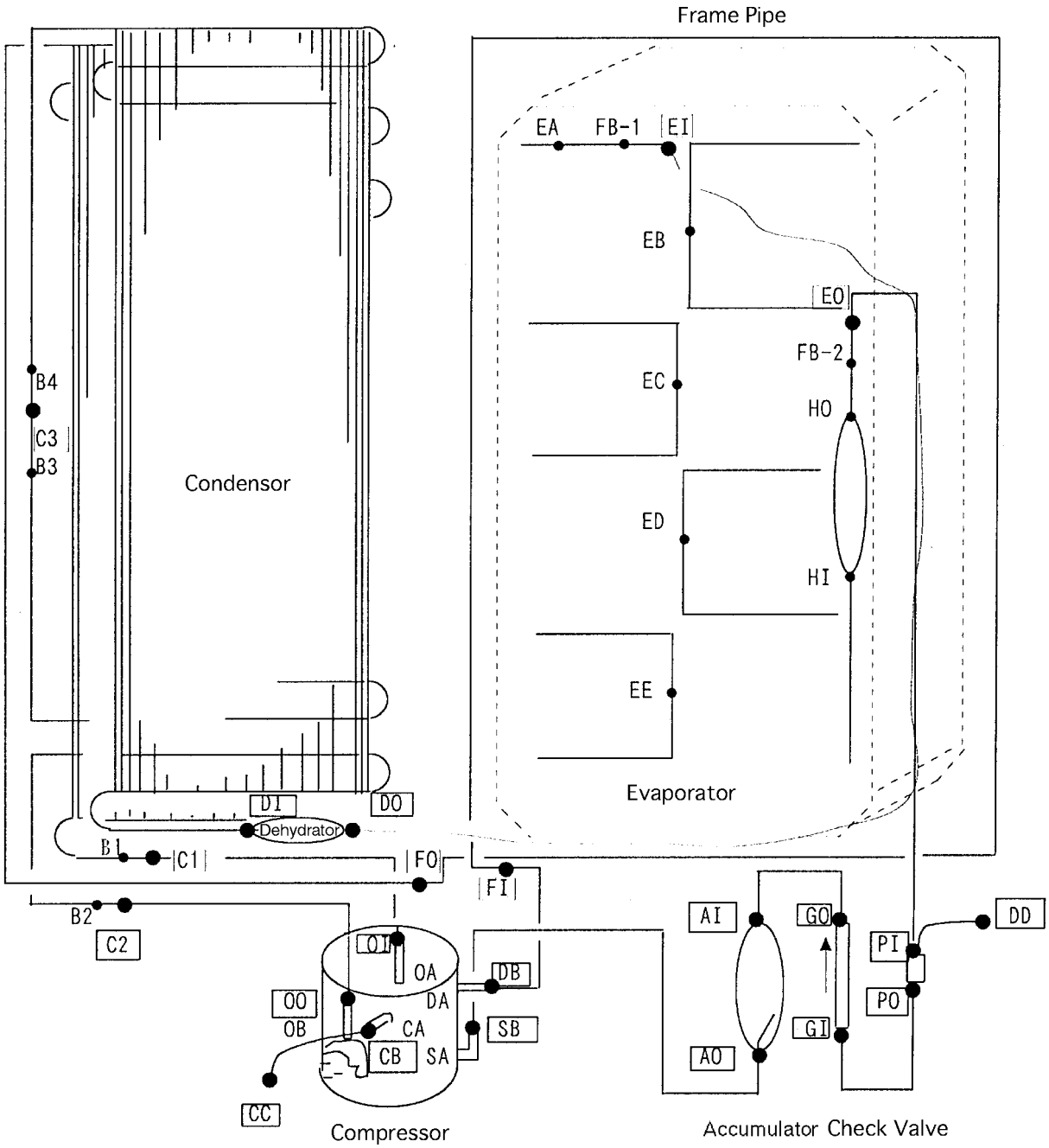
Refrigeration circuit principle diagram

＜MDF-U333＞



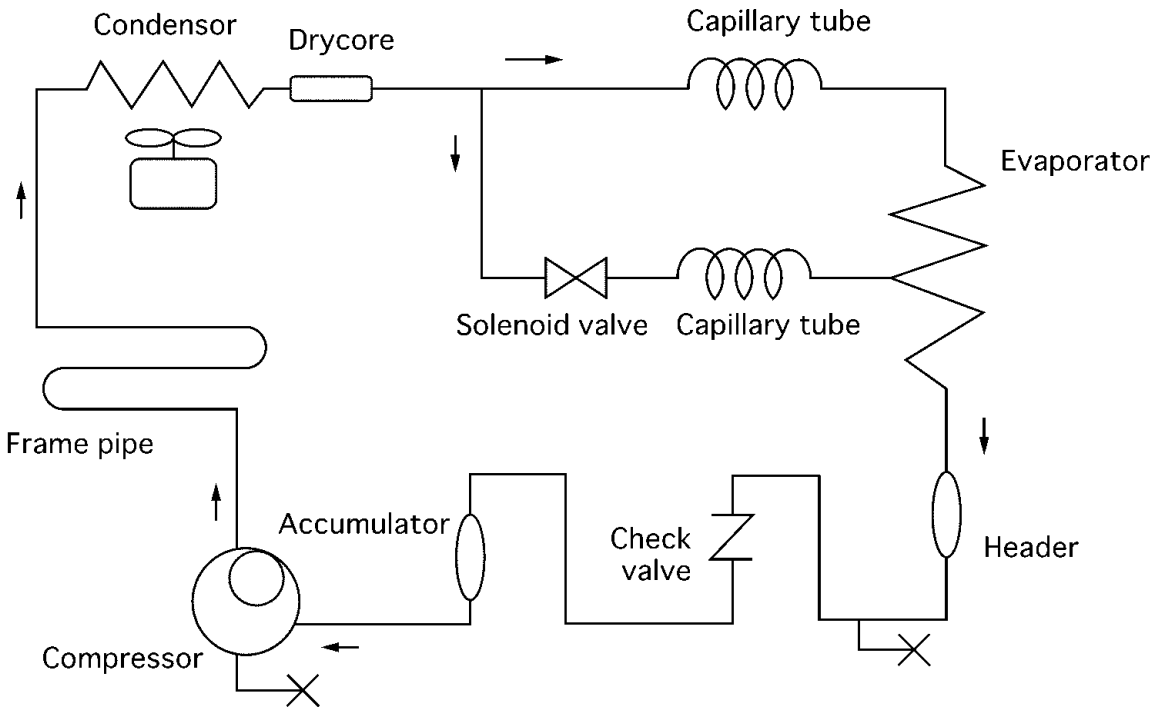
Refrigeration circuit welding points

＜MDF-U333＞



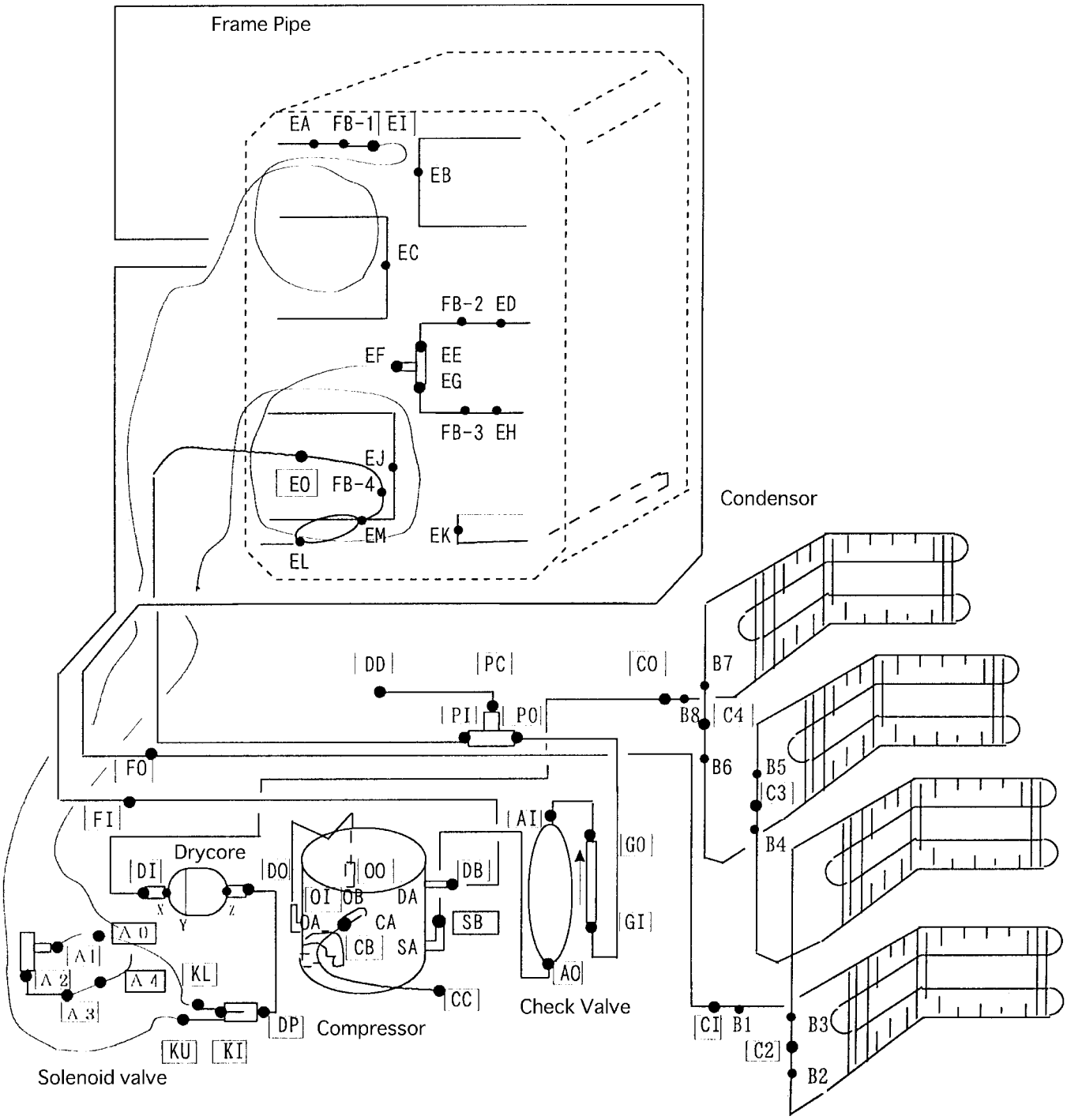
Refrigeration circuit principle diagram

＜MDF-U537＞



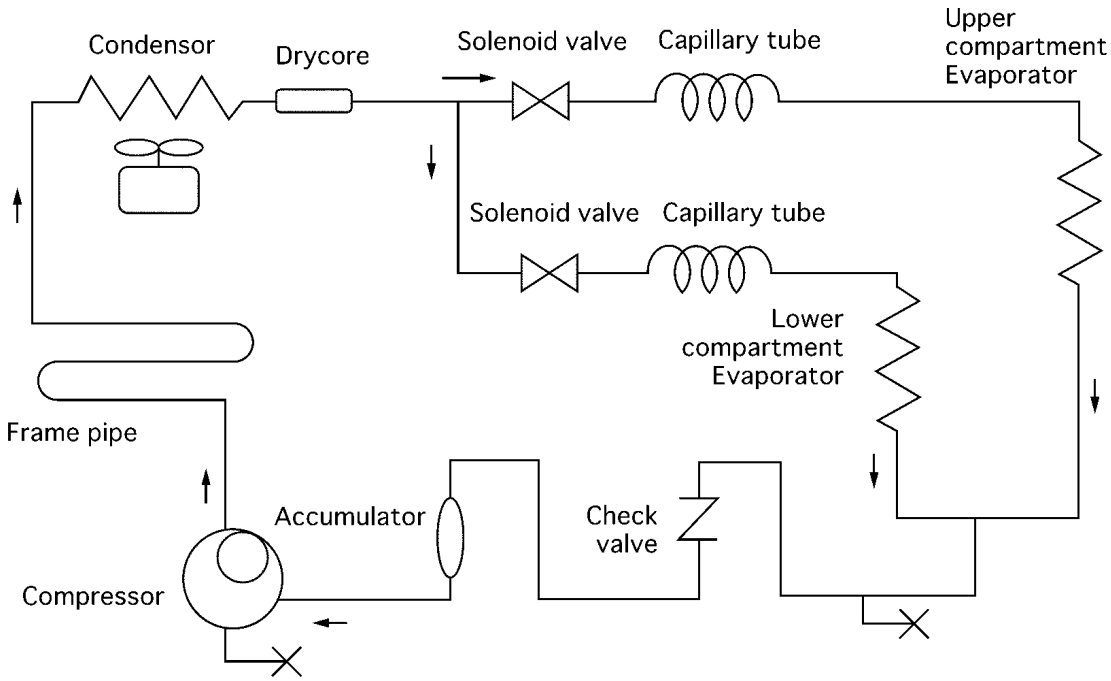
Refrigeration circuit welding points

＜MDF-U537＞



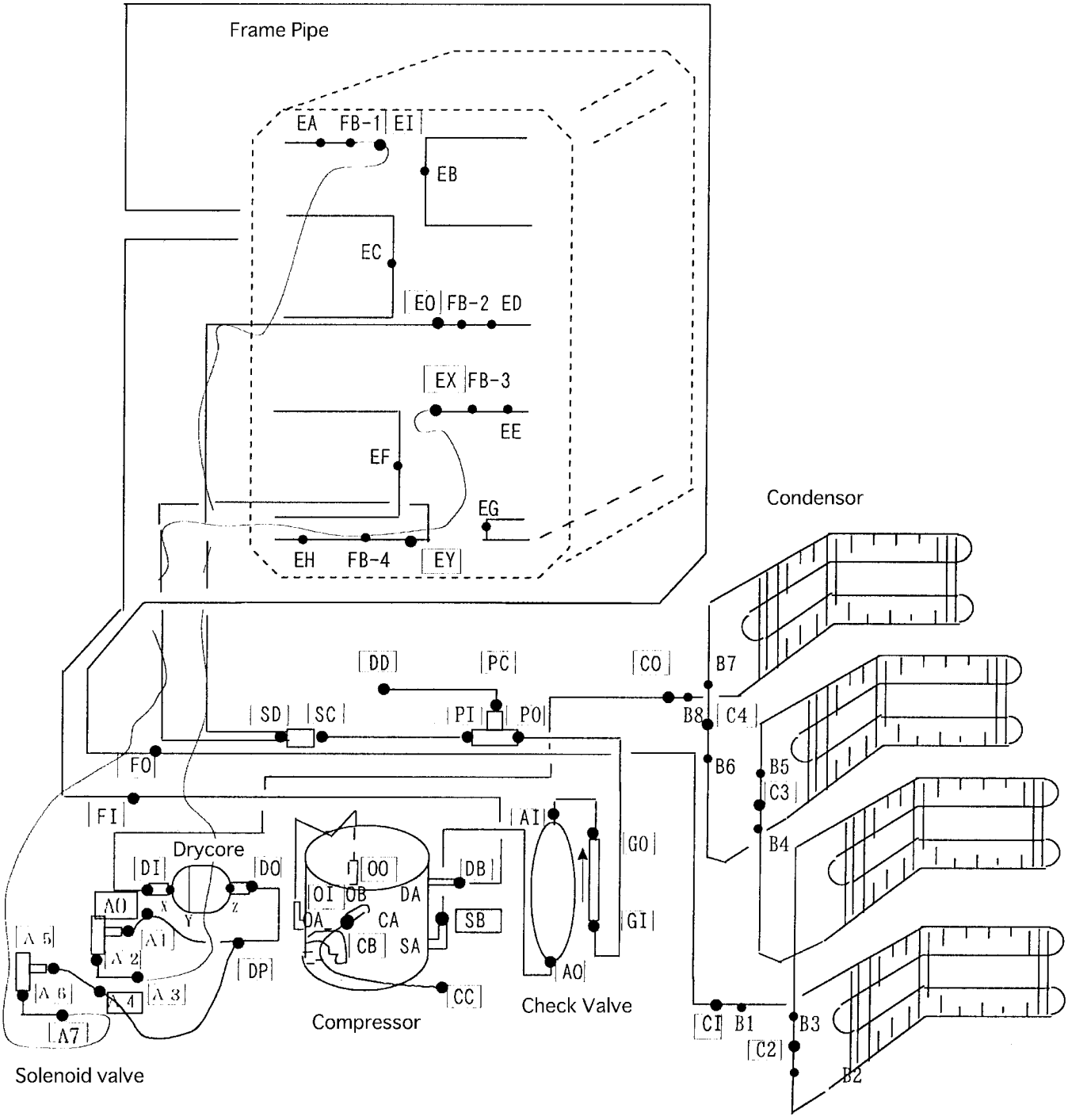
Refrigeration circuit principle diagram

＜MDF-U537D＞



Refrigeration circuit welding points

＜MDF-U537D＞



Electrical Parts

MDF-U333		AC110V,60Hz	AC115V,60Hz	AC220-240V , 50/60Hz
Compressor	Type	C-2SN220L0W	C-2SN220L2W	C-2SN220L5W
	Code	80771120	80771122	80771125
	Rated voltage (50/60Hz)	100 / 100 , 110	-- / 115	220,240 / 220
	Winding resistance C-S(Aux)	5.8Ω	7.2Ω	30.6Ω
	C-R(Main)	1.6Ω	2.0Ω	7.8Ω
Starting relay	Type	AMVL-180A	AMVL-180A	AMVL-300A
	Pick up voltage(50Hz)	AC91V～111V	AC91V～111V	AC185V～217V
	(60Hz)	AC108～128V	AC108～128V	AC215～232V
	Drop out voltage(50Hz)	AC30～65V	AC30～65V	AC60～120V
	(60Hz)	AC30～75V	AC30～75V	AC69～132V
Overload relay	Type	P24KU	P19KU	P10MU
	Action to the temp. (No current)			
	OFF	150±10℃	150±10℃	130±8℃
	ON	85±10℃	85±10℃	69±10℃
	Action to the current (AT25℃)	24.0A	19.5A	10A
	Operation time	6～15 seconds	6～15 seconds	6～15 seconds
	Non-Action to the temp. (80℃)			
	Non-Action	6.1A more than 30 minutes	5.4A more than 30 minutes	2.5A more than 30 minutes
	Action	8.0A within 15 minutes	7.4A within 15 minutes	3.4A within 15 minutes
Starting capacitor	Rating	100μF,160VAC	100μF,160VAC	30μF,300VAC
Running capacitor	Rating	25μF,220VAC	20μF,220VAC	5μF,400VAC
Temp. control relay	Type	G4F-11123T	G4F-11123T	G4F-11123T
	Contact capacity	AC220V,20A	AC220V,20A	AC220V,20A
	Coil	DC12V	DC12V	DC12V
Switching power supply	Type	ZWS10-12/J	ZWS10-12/J	ZWS10-12/J
	Input	AC100-240V 50/60Hz,0.3A	AC100-240V 50/60Hz,0.3A	AC100-240V 50/60Hz,0.3A
	Rated output	DC12V,0.85A	DC12V,0.85A	DC12V,0.85A
Temperature sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5kΩ,25℃	5kΩ,25℃	5kΩ,25℃
P.C.B.	Type	DF-333	DF-333	DF-333
Battery	Type	5HR-AAC	5HR-AAC	5HR-AAC
	Rating	6V 1100MAH	6V 1100MAH	6V 1100MAH
Battery switch	Type	SLE6A2-5	SLE6A2-5	SLE6A2-5
	Rating	AC250V 4A	AC250V 4A	AC250V 4A
Breaker switch	Type	BAM215131	BAM215131	BAM215131
	Rating	AC250V 15A	AC250V 15A	AC250V 15A

Electrical Parts

MDF-U537		AC110-115V,60Hz	AC220V,50/60Hz	AC230V-240V,50Hz
Compressor	Type	C-2SN350L0R	C-2SN350L5S	C-2SN350L5S
	Code	807764201	807763251	807763251
	Rated voltage (50/60Hz)			
	Winding resistance C-S(Aux)	5.8Ω	30.6Ω	30.6Ω
	C-R(Main)	1.6Ω	7.8Ω	7.8Ω
Starting relay	Type	AMVL-180A	AMVL-300A	AMVL-300A
	Pick up voltage(50Hz)	AC91V～111V	AC185V～217V	AC185V～217V
	(60Hz)	AC108～128V	AC215～232V	AC215～232V
	Drop out voltage(50Hz)	AC30～65V	AC60～120V	AC60～120V
	(60Hz)	AC30～75V	AC69～132V	AC69～132V
Overload relay	Type	P18AU	P10MU	P10MU
	Action to the temp. (No current)			
	OFF	120±8℃	130±8℃	130±8℃
	ON	69±10℃	69±10℃	69±10℃
	Action to the current (AT25℃)	18.5A	10A	10A
	Operation time	6～15 seconds	6～15 seconds	6～15 seconds
	Non-Action to the temp. (80℃)			
	Non-Action	4.0A more than 30 minutes	2.5A more than 30 minutes	2.5A more than 30 minutes
	Action	5.5A within 15 minutes	3.4A within 15 minutes	3.4A within 15 minutes
Starting capacitor	Rating	100μF,160VAC	30μF,300VAC	30μF,300VAC
Running capacitor	Rating	25μF,220VAC	5μF,400VAC	5μF,400VAC
Temp. control relay	Type	G4F-11123T	G4F-11123T	G4F-11123T
	Contact capacity	AC220V,20A	AC220V,20A	AC220V,20A
	Coil	DC12V	DC12V	DC12V
Solenoid valve control relay	Type	G2R-1A-T	G2R-1A-T	G2R-1A-T
	Contact capacity	AC250V,10A	AC250V,10A	AC250V,10A
	Coil	DC12V	DC12V	DC12V
Switching power supply	Type	ZWS10-12/J	ZWS10-12/J	ZWS10-12/J
	Input	AC100-240V 50/60Hz,0.3A	AC100-240V 50/60Hz,0.3A	AC100-240V 50/60Hz,0.3A
	Rated output	DC12V,0.85A	DC12V,0.85A	DC12V,0.85A
Temperature sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5kΩ,25℃	5kΩ,25℃	5kΩ,25℃
Solenoid valve control sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5kΩ,25℃	5kΩ,25℃	5kΩ,25℃
Compressor protect sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5kΩ,25℃	5kΩ,25℃	5kΩ,25℃
P.C.B.	Type	DF-537	DF-537	DF-537
Battery	Type	5HR-AAC	5HR-AAC	5HR-AAC
	Rating	6V 1100MAH	6V 1100MAH	6V 1100MAH
Battery switch	Type	SLE6A2-5	SLE6A2-5	SLE6A2-5
	Rating	AC250V 4A	AC250V 4A	AC250V 4A
Breaker switch	Type	BAM215131	BAM215131	BAM215131
	Rating	AC250V 15A	AC250V 15A	AC250V 15A
Solenoid valve coil	Type	NEVAC120V	NEVAC220V	NEVAC240V
	Rating	120V 50/60Hz	220V 50/60Hz	240V 50/60Hz
Condensing fan motor	Type	FU2-A051B1MP	FU2-A051B5MP	FU2-A051B5MP
	Rating	AC110-115V 50/60Hz	220-240V 50/60Hz	220-240V 50/60Hz
	Thermal fuse	130℃	130℃	130℃

Electrical Parts

MDF-U537D		AC110-115V,60Hz	AC220V,50/60Hz	AC230V-240V,50Hz
Compressor	Type	C-2SN350L0R	C-2SN350L5S	C-2SN350L5S
	Code	807764201	807763251	807763251
	Rated voltage (50/60Hz)			
	Winding resistance C-S(Aux)	5.8Ω	30.6Ω	30.6Ω
	C-R(Main)	1.6Ω	7.8Ω	7.8Ω
Starting relay	Type	AMVL-180A	AMVL-300A	AMVL-300A
	Pick up voltage(50Hz)	AC91V～111V	AC185V～217V	AC185V～217V
	(60Hz)	AC108～128V	AC215～232V	AC215～232V
	Drop out voltage(50Hz)	AC30～65V	AC60～120V	AC60～120V
	(60Hz)	AC30～75V	AC69～132V	AC69～132V
Overload relay	Type	P18AU	P10MU	P10MU
	Action to the temp. (No current)			
	OFF	120±8℃	130±8℃	130±8℃
	ON	69±10℃	69±10℃	69±10℃
	Action to the current (AT25℃)	18.5A	10A	10A
	Operation time	6～15 seconds	6～15 seconds	6～15 seconds
	Non-Action to the temp. (80℃)			
	Non-Action	4.0A more than 30 minutes	2.5A more than 30 minutes	2.5A more than 30 minutes
	Action	5.5A within 15 minutes	3.4A within 15 minutes	3.4A within 15 minutes
Starting capacitor	Rating	100μF,160VAC	30μF,300VAC	30μF,300VAC
Running capacitor	Rating	25μF,220VAC	5μF,400VAC	5μF,400VAC
Compressor relay	Type	G4F-11123T	G4F-11123T	G4F-11123T
	Contact capacity	AC220V,20A	AC220V,20A	AC220V,20A
	Coil	DC12V	DC12V	DC12V
Temp. control relay	Type	G2R-1A-T	G2R-1A-T	G2R-1A-T
	Contact capacity	AC250V,10A	AC250V,10A	AC250V,10A
	Coil	DC12V	DC12V	DC12V
Switching power supply	Type	ZWS10-12/J	ZWS10-12/J	ZWS10-12/J
	Input	AC100-240V 50/60Hz,0.3A	AC100-240V 50/60Hz,0.3A	AC100-240V 50/60Hz,0.3A
	Rated output	DC12V,0.85A	DC12V,0.85A	DC12V,0.85A
Temperature sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5kΩ,25℃	5kΩ,25℃	5kΩ,25℃
Solenoid valve control sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5kΩ,25℃	5kΩ,25℃	5kΩ,25℃
Compressor protect sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5kΩ,25℃	5kΩ,25℃	5kΩ,25℃
P.C.B.	Type	DF-537D	DF-537D	DF-537D
Battery	Type	5HR-AAC	5HR-AAC	5HR-AAC
	Rating	6V 1100MAH	6V 1100MAH	6V 1100MAH
Battery switch	Type	SLE6A2-5	SLE6A2-5	SLE6A2-5
	Rating	AC250V 4A	AC250V 4A	AC250V 4A
Breaker switch	Type	BAM215131	BAM215131	BAM215131
	Rating	AC250V 15A	AC250V 15A	AC250V 15A
Solenoid valve coil (2 pcs.)	Type	NEVAC120V	NEVAC220V	NEVAC240V
	Rating	120V 50/60Hz	220V 50/60Hz	240V 50/60Hz
Condensing fan motor	Type	FU2-A051B1MP	FU2-A051B5MP	FU2-A051B5MP
	Rating	AC110-115V 50/60Hz	220-240V 50/60Hz	220-240V 50/60Hz
	Thermal fuse	130℃	130℃	130℃

Specifications of sensor

The following show temperature and resistance characteristics on each thermistor sensor (type 502).

Temperature (℃)	Resistance (kΩ)	Temperature (℃)	Resistance (kΩ)	Temperature (℃)	Resistance (kΩ)
−50	154.50	−7	17.92	12	8.17
−45	116.50	−6	17.16	13	7.85
−40	88.85	−5	16.43	14	7.55
−35	68.15	−4	15.74	15	7.27
−30	52.84	−3	15.08	16	6.99
−25	41.19	−2	14.45	17	6.73
−20	32.43	−1	13.86	18	6.48
−19	30.92	0	13.29	19	6.24
−18	29.50	1	12.74	20	6.01
−17	28.14	2	12.22	25	5.00
−16	26.87	3	11.72	30	4.18
−15	25.65	4	11.25	35	3.51
−14	24.51	5	10.80	40	2.96
−13	23.42	6	10.37	45	2.51
−12	22.39	7	9.96	50	2.14
−11	21.41	8	9.57	55	1.83
−10	20.48	9	9.20	60	1.57
−9	19.58	10	8.84		
−8	18.73	11	8.49		

Control specification

＜MDF-U333･537･537D＞

1. Key and switch

BZ : When alarm lamp is blinking and buzzer sounds, buzzer and remote alarm Output ……Force to turn off
In F25, setting value (time) is except for 000;buzzer will turn ON after the setting time has passed. (This RING BACK function would be carried out in s/n 110XXXXX or bigger)
: Buzzer is not turned off during alarm test.
: When alarm lamp is blinking and buzzer is off, buzzer will not turn on.
: When press this key during power failure, current internal temperature is displayed for 5 seconds.

SET : Press once to setting mode and press again to memorize the set value.
(It works as ENTER key)

DEF : In PV display keep pressing the key over 5 seconds to start defrosting.
During defrosting, press the key to quit defrosting.
During defrosting, internal temperature and “dF” is displayed alternately.
During defrosting, high-low temperature alarm is cancelled.
When sensor error is occurred during defrosting, error code and internal temperature is displayed alternately, and “dF” display is turned off.
During defrosting, only buzzer key is acceptable.

ALARM TEST : Press the key in PV display, alarm test will be start.
Press again then quit alarm test.
During alarm test, alarm lamp will blink and buzzer will sound intermittently.
Digital display will be turned off.
During alarm test, only alarm test key is acceptable.

: During setting mode, shift between the first digit and the second digit.
In PV display, keep pressing the key over 5 seconds to enter the key lock mode. (“L0”display)

: During setting mode, count up the blinking digit. In PV display, keep pressing the key over 5 seconds to enter the function mode (“F00” display)

TOP/BOTTOM : This key is available only in MDF-U537D.
Initially TOP (upper compartment) temperature is displayed.
Press key to display BOTTOM (lower compartment) temperature.
Press this key during power failure to display compartment temperature for 5 seconds, that was not selected before power failure.

2. Temperature control and High, Low temperature alarm

<Temperature control>

Setting range : -18℃～-40℃

Display range : -50℃～+50℃

Setting method : Press SET key and set the required value with ⏫ key and ⏩ Key. Press SET key again to memorize the set value, And then return to PV display.

Out of setting range : If change to out of setting range value by mistake and press SET key , buzzer sound continuously for 1 second.

<Alarm>

High temperature alarm :

When the internal temperature is higher than SV (+5℃～+15℃), alarm lamp and digital display is blinking. After 15min.later, buzzer will sound and remote alarm contact will turn ON. (initial value: +10℃)

Low temperature alarm :

When the internal temperature is lower than SV(-5℃～-15℃), alarm lamp and digital display is blinking. After 15min.later, buzzer will sound and remote alarm contact will turn ON. (initial value: -10℃)

Setting method :

Keep pressing ⏫ key over 5 seconds to enter function mode (“F00”).

Then press ⏫ key to count up value. Change “F01” to input high temperature alarm value, “F02” to input low temperature alarm value.

Set either “F01” or “F02” then press SET key to turn alarm temperature setting mode to set required value with ⏫ key and ⏩ key.

Press SET key again to memorize value.

Out of setting range :

If change to out of setting range value by mistake and press SET key, sound buzzer continuously for 1second and remain in setting mode to maintain the setting value.

3. Defrosting

This function is different by each model code (products) .

a. In PV display keep pressing DEF key over 5 seconds, defrosting will be started.

Model code 001 (MDF-U333) --- Force to turn compressor OFF.

Model code 002 (MDF-U537) --- Force to turn compressor & solenoid valve OFF. (Use 1 solenoid valve)

Model code 003 (MDF-U537D)

--- Single compartment → Force to turn OFF solenoid valve at the ROOM lamp illuminated.

--- Both compartments → Force to turn OFF 2 solenoid valves & compressor.

b. Press again DEF key to quit defrosting.(Manual start and finish)

4. Self diagnosis function

E01 : Temperature sensor (upper compartment temperature sensor for MDF-U537D) is open circuit
E02 : Temperature sensor (upper compartment temperature sensor for MDF-U537D) is short circuit
E03 : Lower compartment temperature sensor is open circuit（for MDF-U537D only）
E04 : Lower compartment temperature sensor is short circuit（for MDF-U537D only）
E05 : Compressor protect sensor is open circuit (for MDF-U537,U537D)
E06 : Compressor protect sensor is short circuit (for MDF-U537,U537D)
E07 : Solenoid valve control sensor is open circuit (for MDF-U537 only)
E08 : Solenoid valve control sensor is short circuit (for MDF-U537 only)
E09 : Buttery switch OFF with ALARM TEST
E10 : Compressor temperature is abnormal（for MDF-U537, U537D）

a. Model code setting (for code: 001,002,003)
When temperature sensor is open circuit, display shows alternately E01 with –50℃.
When temperature sensor is short circuit, display shows alternately E02 with +50℃.

b. Model code setting (for code: 002)
When solenoid valve control sensor is open circuit, display shows alternately E07 with –50℃.
When solenoid valve control sensor is short circuit, display shows alternately E08 with +50℃.

c. Model code setting (for code: 003)
When TOP lamp is displayed, display shows same as a. in upper compartment.
When BOTTOM lamp is displayed, display shows lower compartment temperature.
When lower compartment temperature sensor is open circuit, display shows alternately E03 with –50℃.
When lower compartment temperature sensor is short circuit, display shows alternately E04 with +50℃.

d. Error diagnosis
Self diagnosis of open circuit is done when it is lower than -60℃.
Self diagnosis of short circuit is done when it is higher than +60℃.
E09 is functioned only during ALARM TEST is performed.
In E10 is displayed: When condenser temperature is higher than 85℃, it diagnoses as abnormal and indicate E10. When condenser temperature is higher than 100℃ force to turn compressor OFF.
When condenser temperature is lower than 65℃, it diagnoses as normal and cancel to force compressor turn OFF.
When numbers of error happened simultaneously, error code of smallest number will be displayed. With exception for MDF-U537D, alternative display of error code and PV,which is selected compartment internal temperature .
During power failure, display shows alternately E09 with blank.

5. Key lock function

In PV display、Keep pushing ▶▶ key over 5 seconds to enter key lock mode displaying with "L0".

Push ▲▲ key to 1 ‧‧‧‧‧key lock ON

0 ‧‧‧‧‧key lock OFF

then press SET key to memorize set value then return to PV display.

Note） With key lock ON to enter SET mode, but unable to change value.

With key lock ON to perform Function and ALARM TEST, while unable to perform DEF.

6. Power failure alarm (Buzzer and display isn't functioned without buttery power supplied)

When power failure is occurred, power failure alarm will be turned on by battery inside units.

During power failure alarm, alarm lamp is blinking, digit display turns off, buzzer sounds intermittently and remote alarm contact turns ON.

Press BZ key to turn power failure alarm buzzer OFF.

Press BZ key to display PV for 5 seconds.

During power failure alarm, only BZ key (TOP/BOTTOM key for MDF-U537D) is available.

7. Alarm test

The function is to check performance (failure) for alarm lamp, buzzer and remote alarm.

In PV display, press ALARM TEST key to blink alarm lamp, to sound buzzer intermittently, to turn remote alarm contact on (Without time delay). Digital display will be turned off.

During alarm test, only ALARM TEST key is available.

Note: During alarm test, with buttery switch turned OFF to display error code E09.

Displaying error code E09 takes priority over other error codes before ALARM TEST is performed.

8. Auto return function

Function: During setting mode or key lock mode or function mode with any key not pressed for 90 seconds, value will not be memorized to return to PV mode automatically.

Note: In F09 or F10, auto return function will not be performed.

9. Compressor delay start time

During cycle time, normally force to turn compressor OFF after 2 minutes passed compressor turned off.

When main power is supplied (microcomputer is RESET), changeable to set compressor time lag for 1 ～15 minutes. (See F05)

10. Function mode

Functions are as follow.

F00 : To return to PV display
F01 : To change temperature of high temperature alarm
F02 : To change temperature of low temperature alarm
F03 : To change temperature of high temperature alarm
(Applied for lower compartment of MDF-U537D)
F04 : To change temperature of low temperature alarm
(Applied for lower compartment of MDF-U537D)
F05 : To set compressor delay start time
F06 : To input service code (384)
F07 : To adjust zero for temperature sensor
(Upper compartment sensor for MDF-U537D)
F08 : To adjust zero for temperature sensor
(Not available for MDF-U333)
(Solenoid valve control sensor for MDF-U537)
(Lower compartment sensor for MDF-U537D)
F09 : Not available
F10 : Not available
F11 : Not functioned. Return to PV display.
F12 : To display temperature of temperature sensor (per 0.1℃)
F13 : To display temperature of MDF-U537/U537D compressor protect sensor (per 1℃)
F14 : To display temperature of temperature sensor (per 0.1℃)
(Solenoid valve control sensor for MDF-U537)
(Lower compartment sensor for MDF-U537D)
F15 : Not available
F16 : Not functioned. Return to PV display.
F17 : To set or check model code
model code 001: MDF-U333
model code 002: MDF-U537
model code 003: MDF-U537D
F18 : Preset value for second offset performance: -26℃ (for MDF-U537/U537D)
F19 : Not functioned. Return to PV display.
F20 : Not functioned. Return to PV display.
F21 : To set communication ID（000～255）
F22 : To set communication mode
F23,24,26～29 : With input each function code, press SET key to sound buzzer 1 second continuously to maintain input status.
F25 : To set alarm ring back time
Setting value: 000,010,020,030,040,050,060

Setting method :

In PV display, keep ⏫ key pressing over 5 seconds to enter function mode and will be displayed “F00”. Press ⏫ key to input required function code then press SET key again.

F00 : Not functioned. In F00 displayed, press SET key to return PV display.

F01 : To set temperature of high temp. alarm performance in the range of +5℃～+15℃.
(initial value : +10℃)

F02 : To set temperature of low temp. alarm performance in the range of -5℃～-15℃.
(initial value : -10℃)

F03 : To set temperature of high temp. alarm performance in the range of +5℃～+15℃.
(initial value : +10℃)
Return to PV display except for lower compartment of MDF-U537D.

F04 : To set temperature of low temp. alarm performance in the range of -5℃～-15℃.
(initial value : -10℃)
Return to PV display except for lower compartment of MDF-U537D.

F05 : To set compressor delay start time
（performed only when main power supplied or microcomputer reset）
The function is to reduce compressor's start up failure or breaker's blown out that caused by numbers of units simultaneous start up after power failure.
The setting range of time lag is 1～15 minutes. (Initial value is 1 minute on factory outgoing)
SV before doing factory's performance test, is 3 seconds or less. Therefore, the time lag is 0 (3 seconds) when PCB replacement is done in service. It is recommended to input 1～15 for value when PCB is replaced.

F06 : Input service code with ⏫ key and ⏩ key when F07 and following functions, except F21, F22 and F25 would be performed. Press SET key to memorize service code to enter function mode again to perform F07 and following functions.

Service code : 384

Note）Service code is memorized unless input "000" again in "F06", or turn power OFF.
(Turn OFF = buttery switch and power supply switch are turned OFF)
Note) After using service code on service, input "000" again in "F06".

F07 :To adjust 0 of temperature sensor (setting range: -9.9℃～+9.9℃)
Setting method: In "F07" displayed, press SET key to display "00.0"（initial value）.
Set temperature with ⏫ key and ⏩ key and press SET key again to memorize set value. Input is done by differential value.

Ex） When actual temperature of 1/2h is shown –28.5℃and digital display is shown -30℃, add +1.5 to value in F07.
Calculation = (-28.5-(-30)) = +1.5

⏫ key enables to change only "0" and "-" in second digit and to change "0"～"9" in first digit and first decimal place.
⏩ key enables to shift the second digit ⇔ the first digit ⇔ the first decimal place⇔the second digit.

F08 : To adjust 0 of temperature sensor（setting range: -9.9℃～+9.9℃）
In F17: It is functioned in model code 002(MDF-U537), 003(MDF-U537D).
Return to PV display in model code 001(MDF-U333)
Setting method: In ”F08” displayed, press SET key to display ”00.0”（initial value）.
Set temperature with ⏫ key and ⏩ key and press SET key again to memorize set value. Input is done by differential value.

Ex）When actual temperature of 1/2h chamber is shown –28.5℃and digital display is shown -30℃, add +1.5 to value in F08.
Calculation = (-28.5-(-30)) = +1.5
⏫key enables to change only “0” and “-“ in second digit and to change “0”～”9” in first digit and first decimal place.
⏩ key enables to shift the second digit ⇔ the first digit ⇔ the first decimal place⇔the second digit.

F12 : Temperature of temperature sensor is displayed as per 0.1℃.
From second digit to first decimal point is shown in display.
It is not shown “-“ in display when temperature is lower than -20℃.
(Ex. Actual temperature -35℃ → Display shows 35.0℃)
When temperature is within the range of -19.9℃～-0.1℃, ”-“ is displayed.
Range : -72.0～+83.0℃（±9.9℃）

F13 : Temperature of compressor protect sensor is displayed as per 1℃.
Range: -72～+163℃

F14 : Temperature sensor (solenoid valve control sensor for MDF-U537, lower compartment temperature control sensor for MDF-U537D)
Temperature of each sensor is displayed as per 0.1℃
From second digit to first decimal point is shown in display.
It is not shown “-“ in display when temperature is lower than -20℃.
(Ex. Actual temperature -35℃ → Display shows 35.0℃)
When temperature is within the range of -19.9℃～-0.1℃, ”-“ is displayed.
Range : -72.0～+83.0℃

F17 ：Model code setting or checking

001 ：MDF-U333

002 ：MDF-U537

002 ：MDF-U537D

Followings are initial setting values

Internal temp. SV ： -30℃ (for U537D : both compartments)

Key lock mode ： 0 （OFF）

High temperature alarm ： SV+10℃(for U537D : both compartments)

Low temperature alarm ： SV-10℃(for U537D : both compartments)

0 adjustment：+0℃（for temperature sensor）

Compressor start delay time ： 1 minute

Communication ID ： 000

Communication mode ： 000

Alarm ring back time ： 030 (30 minutes)

Set model code as MDF-U537, MDF-U537D to activate compressor protect function.

F21 ： To set serial communication ID.

Input range: 000～255 （000 means that communication is OFF）

F22 ： To set serial communication mode.

Control mode（3rd digit） 0 ： Local （initial value）

1 ： Remote

Baud rate（2nd digit） 0 ： 2400bps （initial value）

1 ： 4800bps

2 ： 9600bps

1st digit is not used.

Note） Set control mode as “remote” unable to change SV and to activate defrosting.

F25 ： To set value for alarm recovery (ring back) time.

Input value: 000,010,020,030,040,050,060 (In 000, recovery function is OFF)

11. Differential（COMP. ON/OFF point on program）

COMP ON permit ： Activate at +0.0℃ higher than SV

COMP OFF： Activate at -0.6℃ lower than SV

12. Offset value

The function is to correct differential value between temperature of temperature sensor and of internal 1/2H (centre of chamber).

Initial offset

001 (MDF-U333): Shift –1.5℃from temperature of temperature control sensor (PV)

002 (MDF-U537): Shift +1.0℃from temperature of temperature control sensor (PV)
(For upper, lower compartment)

003 (MDF-U537D): Shift +0.0℃from temperature of temperature control sensor (PV)
(For upper, lower compartment)

Second offset

001 (MDF-U333): None

002 (MDF-U537):-18℃≧SV≧-25℃--- shift –0℃from PV (For upper, lower compartment)
-26℃≧SV -- shift +1.0 from PV (For upper, lower compartment)

003 (MDF-U537D):-18℃≧SV≧-30℃--- shift PV-2.4+(-18-SV)÷5 (For upper compartment)
-30℃＞SV --- shift –0℃from PV (For upper compartment)
*Note) For lower compartment, add 0℃ to PV.

13. Display offset

In display, temperature that is lower than SV is shown for a little time. With this case, display offset –0.5℃should be done. (Round off numbers to the first decimal point)

14. Remote alarm

During normal operation … … … Remote alarm contact is OPEN

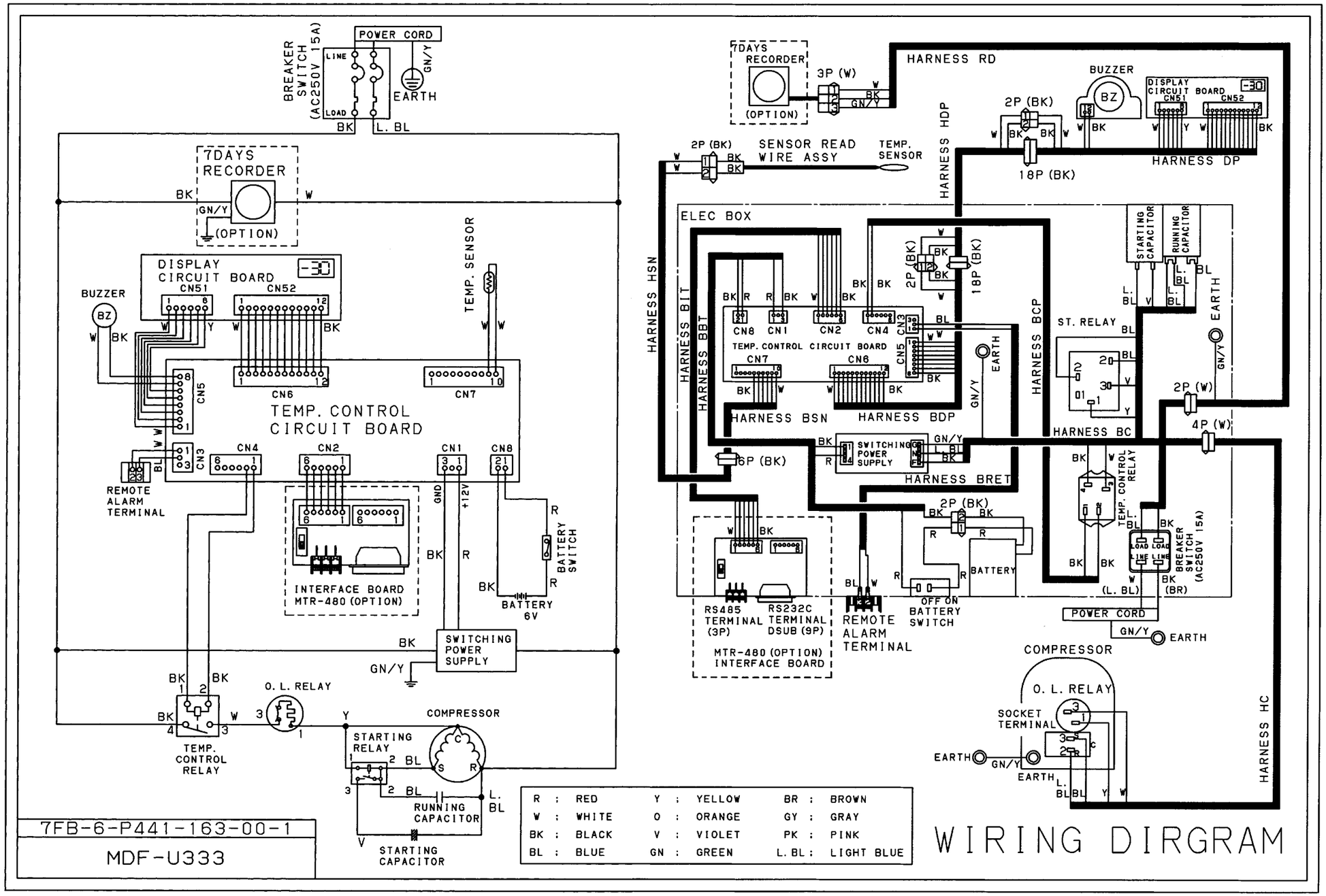
During alarm or power failure … … … Remote alarm contact is CLOSE

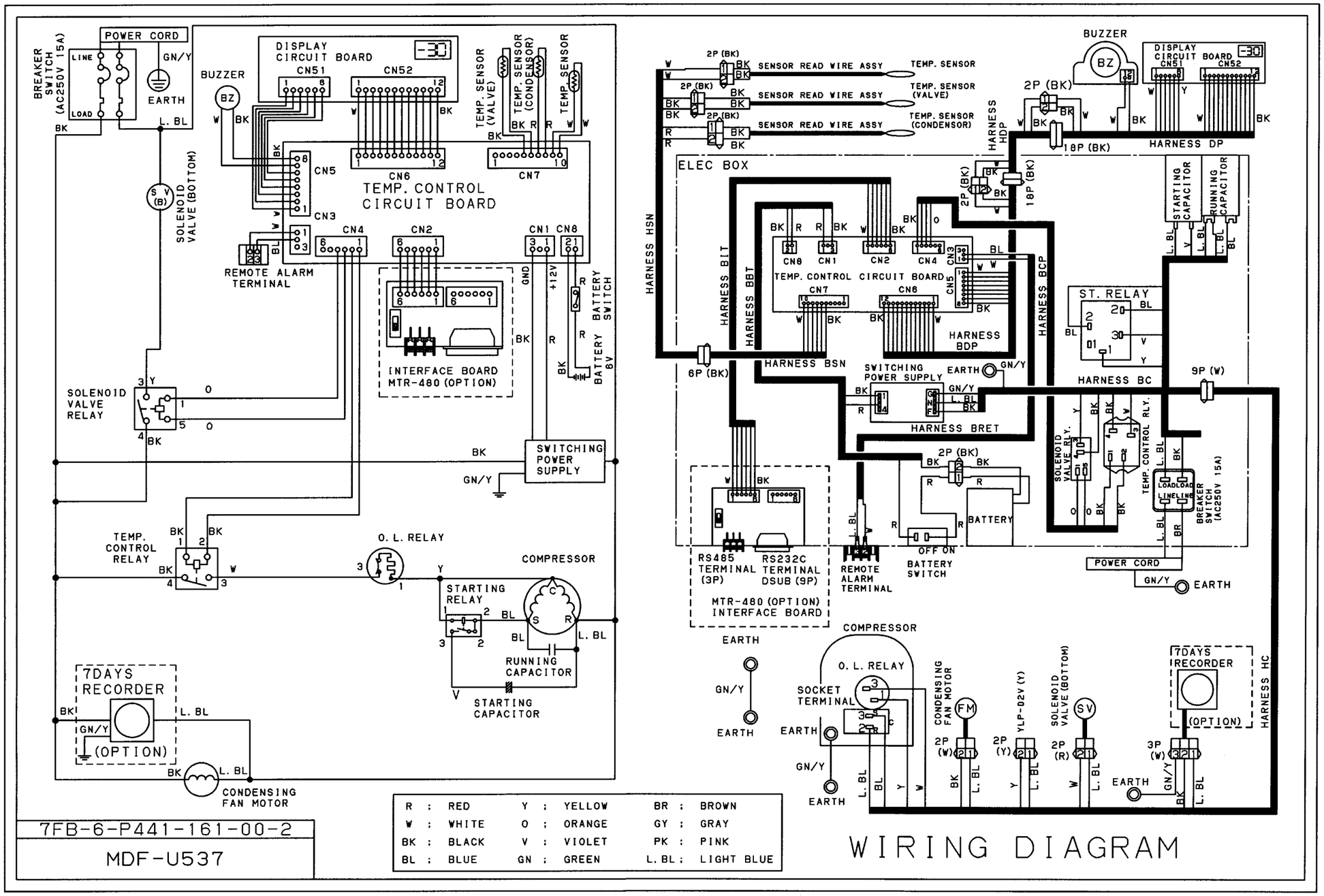
15. Others

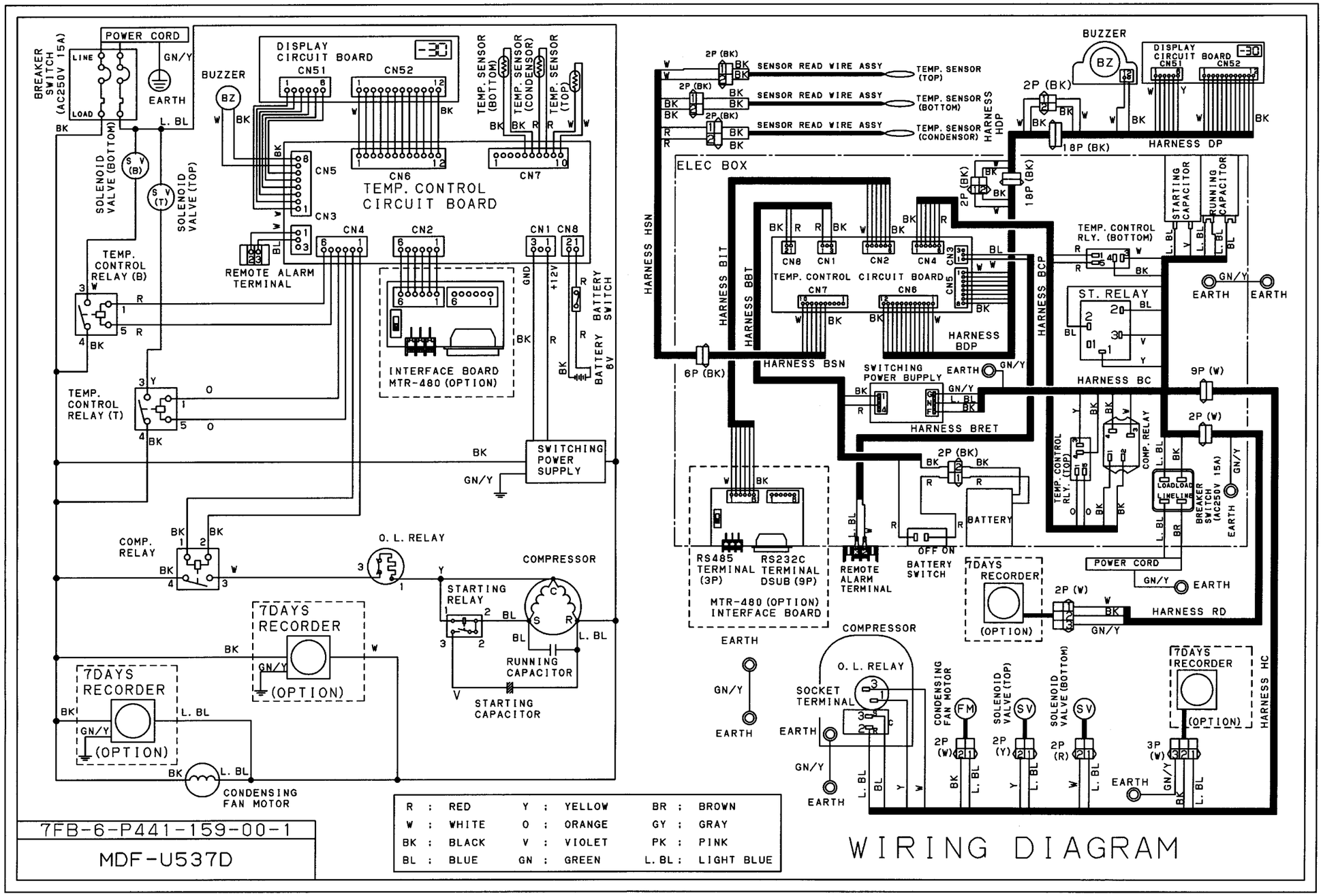
MDF-U537: In case of : -18℃≧SV≧–25℃ with PV-SV+5℃≧0
Solenoid valve is: Forced to turn OFF

MDF-U537: In case of : PV-(SV-0.6℃)≧0 with PV_{TOP} - PV_{BOTTOM} -1＞0
Solenoid valve is: Forced to turn OFF
(In PV-(SV-0.6)＜0, quit to be forced to turn OFF)

Wiring diagram

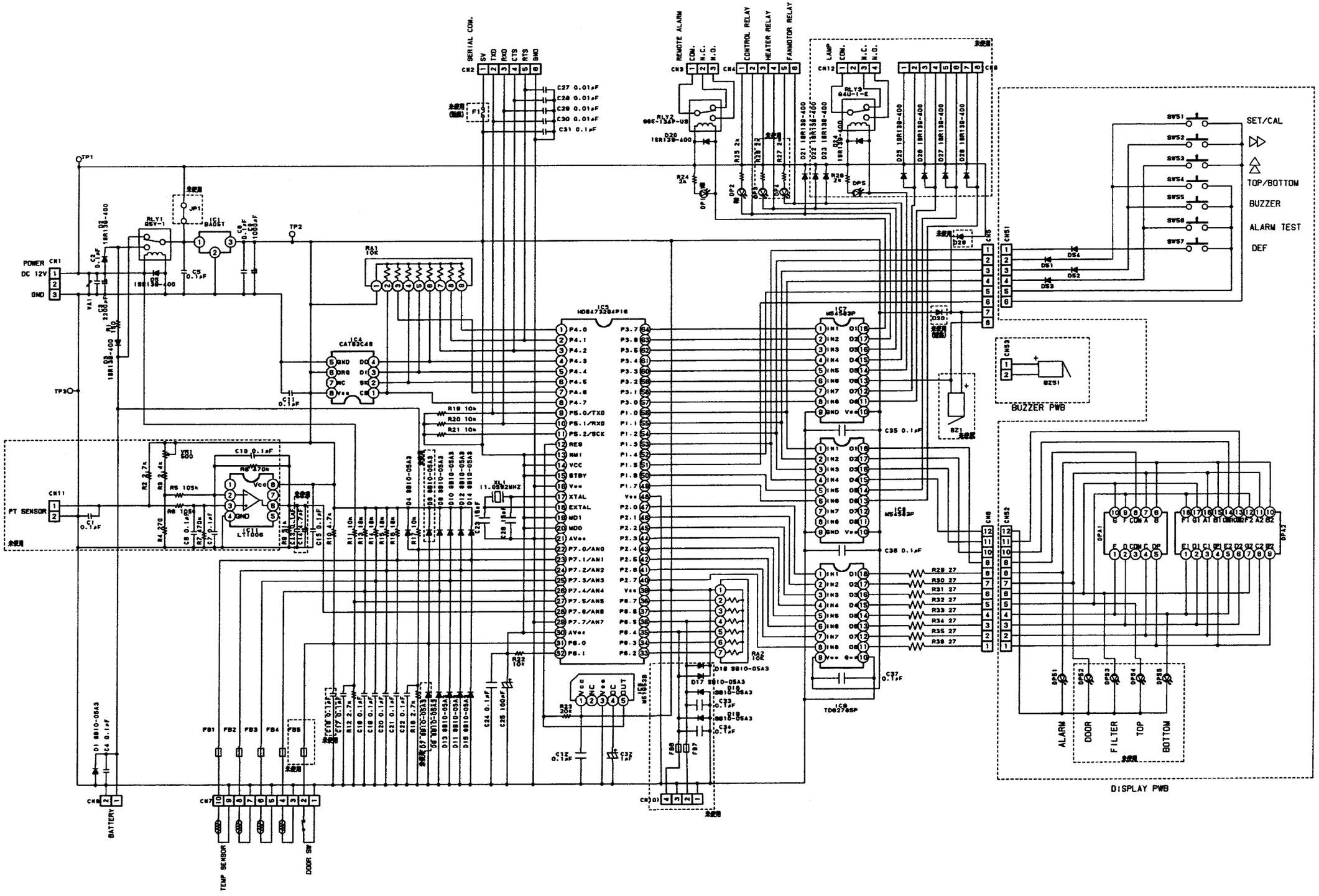



POWER CORD
BREAKER SWITCH (AC250V 15A)
LINE
LOAD
GN/Y
EARTH
L. BL
BK
SOLENOID VALVE (BOTTOM)
S V (B)
BUZZER
BZ
DISPLAY CIRCUIT BOARD
CN51
CN52
TEMP. SENSOR (VALVE)
TEMP. SENSOR (CONDENSOR)
TEMP. SENSOR
CN5
CN6
CN7
CN3
CN4
CN2
CN1
CN8
TEMP. CONTROL CIRCUIT BOARD
REMOTE ALARM TERMINAL
GND
+12V
BATTERY SWITCH
BATTERY 6V
INTERFACE BOARD MTR-480 (OPTION)
SOLENOID VALVE RELAY
SWITCHING POWER SUPPLY
TEMP. CONTROL RELAY
O. L. RELAY
COMPRESSOR
STARTING RELAY
RUNNING CAPACITOR
STARTING CAPACITOR
7DAYS RECORDER
(OPTION)
CONDENSING FAN MOTOR
7FB-6-P441-161-00-2
MDF-U537
SENSOR READ WIRE ASSY
HARNESS HSN
HARNESS BIT
HARNESS BBT
HARNESS BSN
HARNESS HDP
HARNESS DP
HARNESS BDP
HARNESS BCP
HARNESS BRET
HARNESS BC
HARNESS HC
6P (BK)
18P (BK)
9P (W)
ST. RELAY
STARTING CAPACITOR
RUNNING CAPACITOR
SOLENOID VALVE RLY.
TEMP. CONTROL RLY.
BREAKER SWITCH (AC250V 15A)
RS485 TERMINAL (3P)
RS232C TERMINAL DSUB (9P)
MTR-480 (OPTION) INTERFACE BOARD
REMOTE ALARM TERMINAL
OFF ON
BATTERY SWITCH
BATTERY
POWER CORD
SOCKET TERMINAL
YLP-02V (Y)
R : RED
W : WHITE
BK : BLACK
BL : BLUE
Y : YELLOW
O : ORANGE
GN : GREEN
BR : BROWN
GY : GRAY
PK : PINK
L. BL : LIGHT BLUE
WIRING DIAGRAM


POWER CORD
BREAKER SWITCH (AC250V 15A)
LINE
LOAD
GN/Y
EARTH
L. BL
BK
SOLENOID VALVE (BOTTOM)
SOLENOID VALVE (TOP)
BUZZER
BZ
DISPLAY CIRCUIT BOARD
CN51
CN52
TEMP. SENSOR (BOTTOM)
TEMP. SENSOR (CONDENSOR)
TEMP. SENSOR (TOP)
CN5
CN6
CN7
CN3
CN4
CN2
CN1 CN8
TEMP. CONTROL CIRCUIT BOARD
REMOTE ALARM TERMINAL
TEMP. CONTROL RELAY (B)
TEMP. CONTROL RELAY (T)
INTERFACE BOARD MTR-480 (OPTION)
GND
+12V
BATTERY SWITCH
BATTERY 6V
SWITCHING POWER SUPPLY
COMP. RELAY
O. L. RELAY
COMPRESSOR
STARTING RELAY
RUNNING CAPACITOR
STARTING CAPACITOR
7DAYS RECORDER
(OPTION)
CONDENSING FAN MOTOR
SENSOR READ WIRE ASSY
TEMP. SENSOR (TOP)
TEMP. SENSOR (BOTTOM)
TEMP. SENSOR (CONDENSOR)
HARNESS HDP
HARNESS DP
18P (BK)
ELEC BOX
HARNESS HSN
HARNESS BIT
HARNESS BBT
HARNESS BSN
HARNESS BDP
HARNESS BCP
HARNESS BC
HARNESS BRET
HARNESS RD
HARNESS HC
6P (BK)
9P (W)
2P (W)
2P (BK)
STARTING CAPACITOR
RUNNING CAPACITOR
TEMP. CONTROL RLY. (BOTTOM)
ST. RELAY
TEMP. CONTROL RLY. (TOP)
BATTERY
OFF ON
BATTERY SWITCH
RS485 TERMINAL (3P)
RS232C TERMINAL DSUB (9P)
MTR-480 (OPTION) INTERFACE BOARD
REMOTE ALARM TERMINAL
SOCKET TERMINAL
SOLENOID VALVE (TOP)
SOLENOID VALVE (BOTTOM)
R : RED
W : WHITE
BK : BLACK
BL : BLUE
Y : YELLOW
O : ORANGE
V : VIOLET
GN : GREEN
BR : BROWN
GY : GRAY
PK : PINK
L. BL : LIGHT BLUE
7FB-6-P441-159-00-1
MDF-U537D
WIRING DIAGRAM

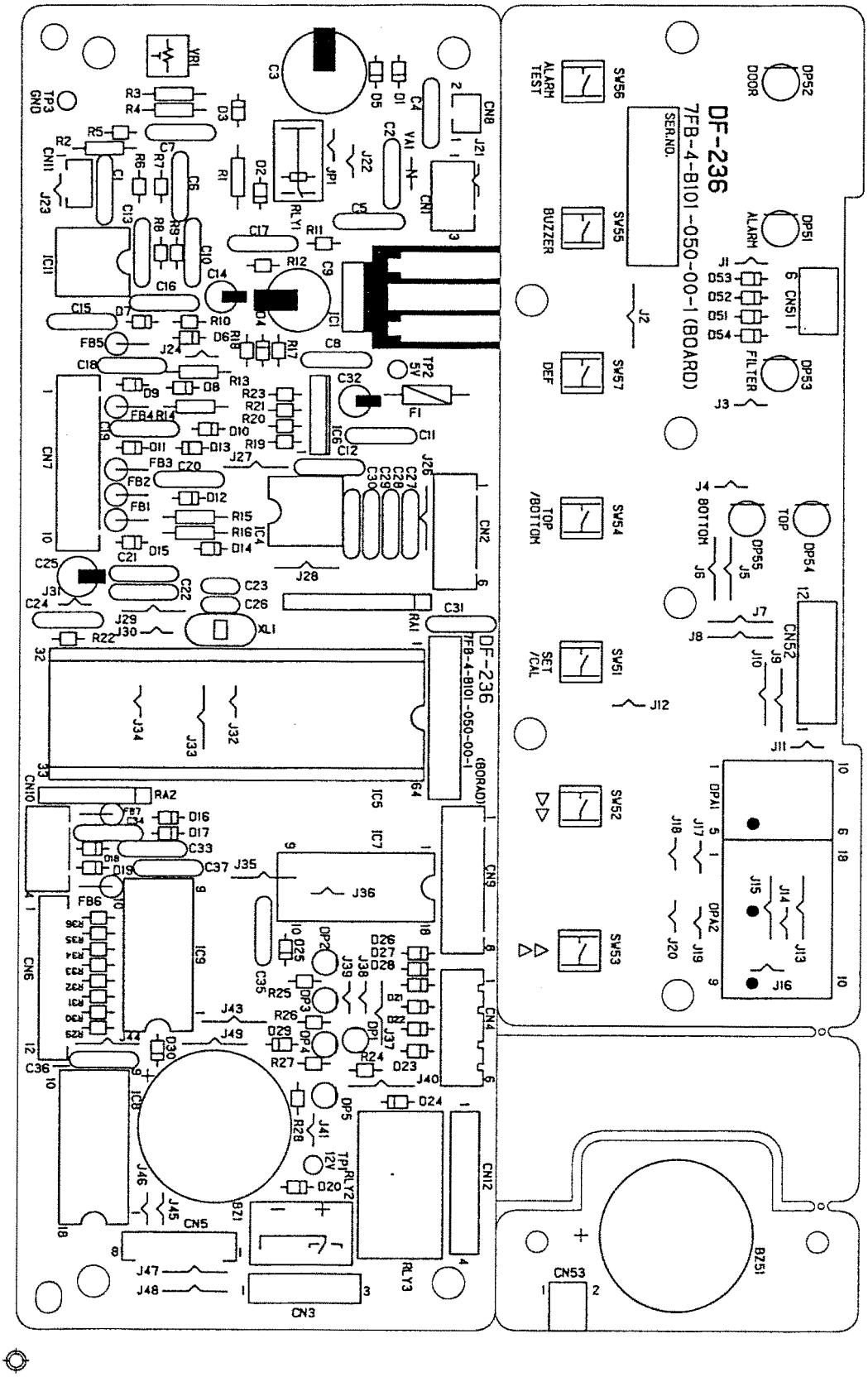
Circuit diagram

<Main PCB>



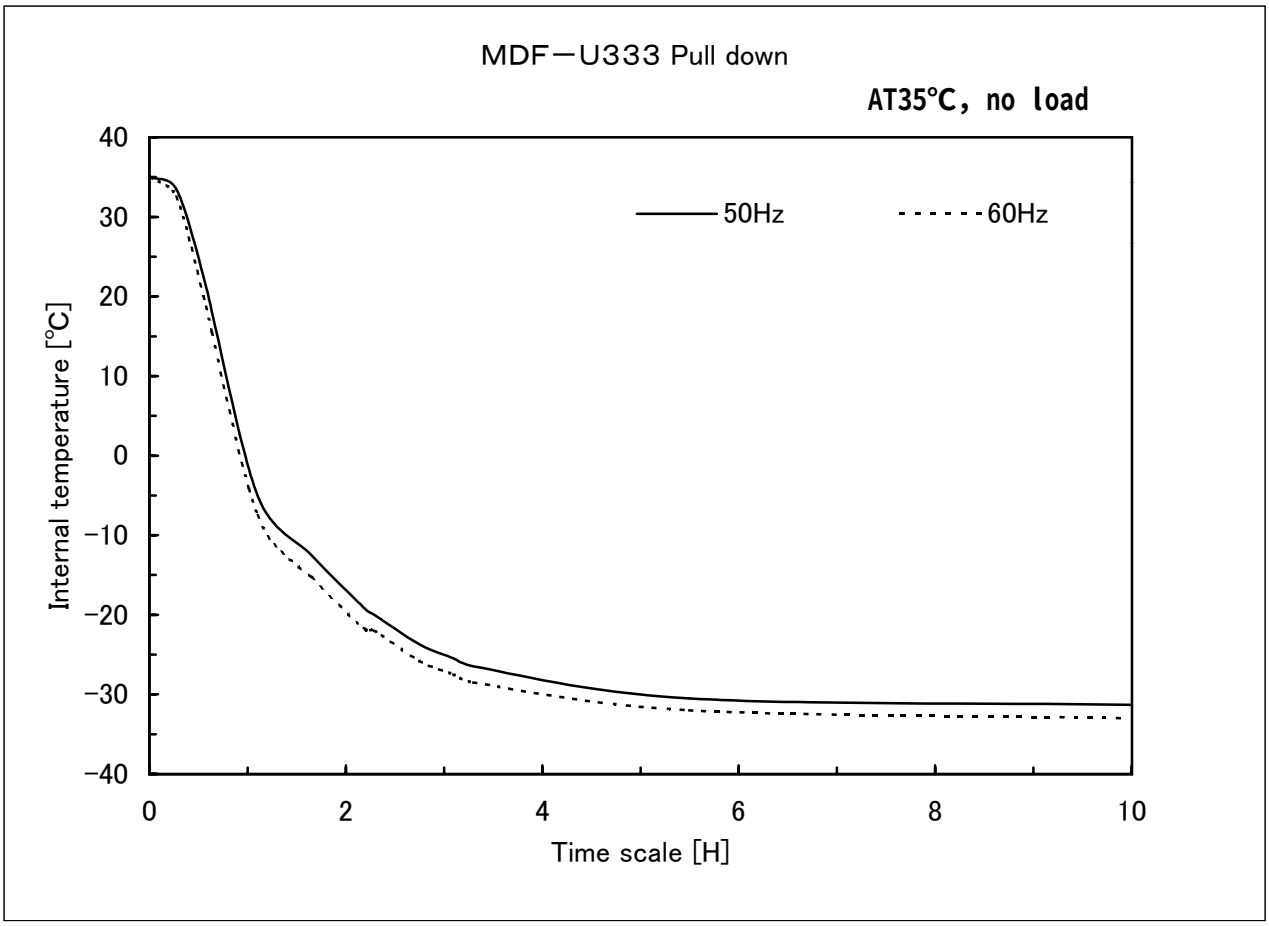
Components on PCB

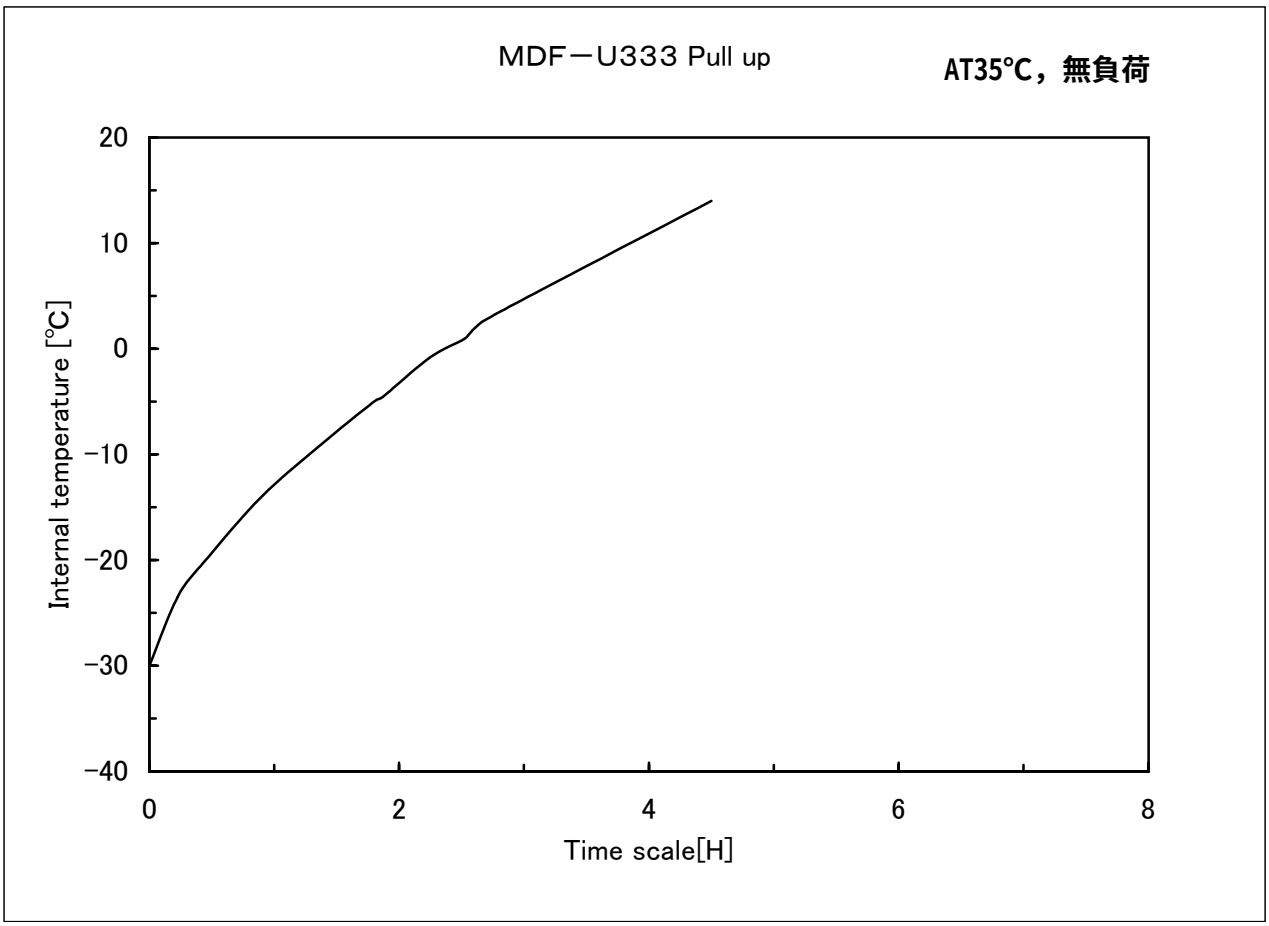
<Main PCB>

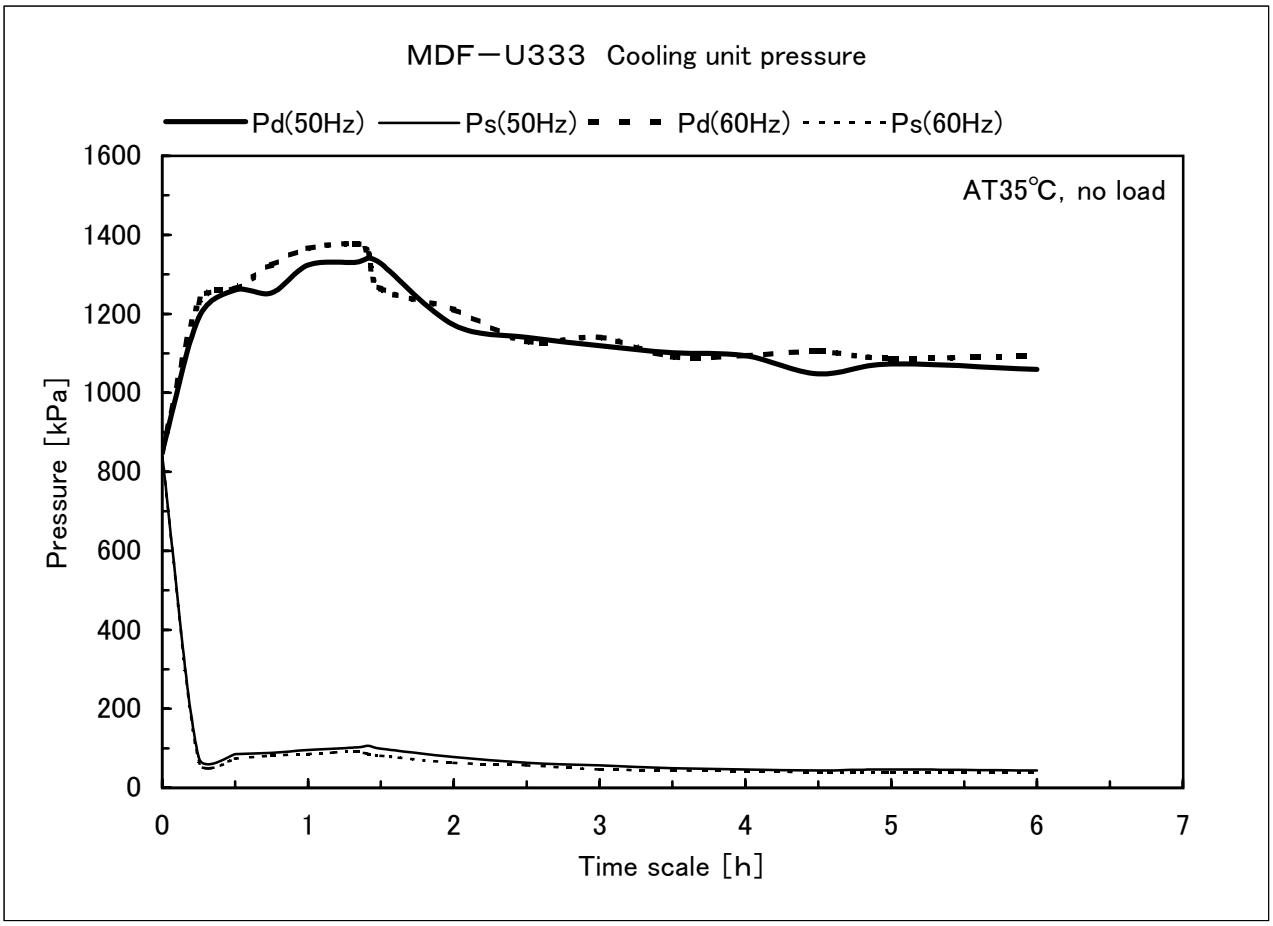


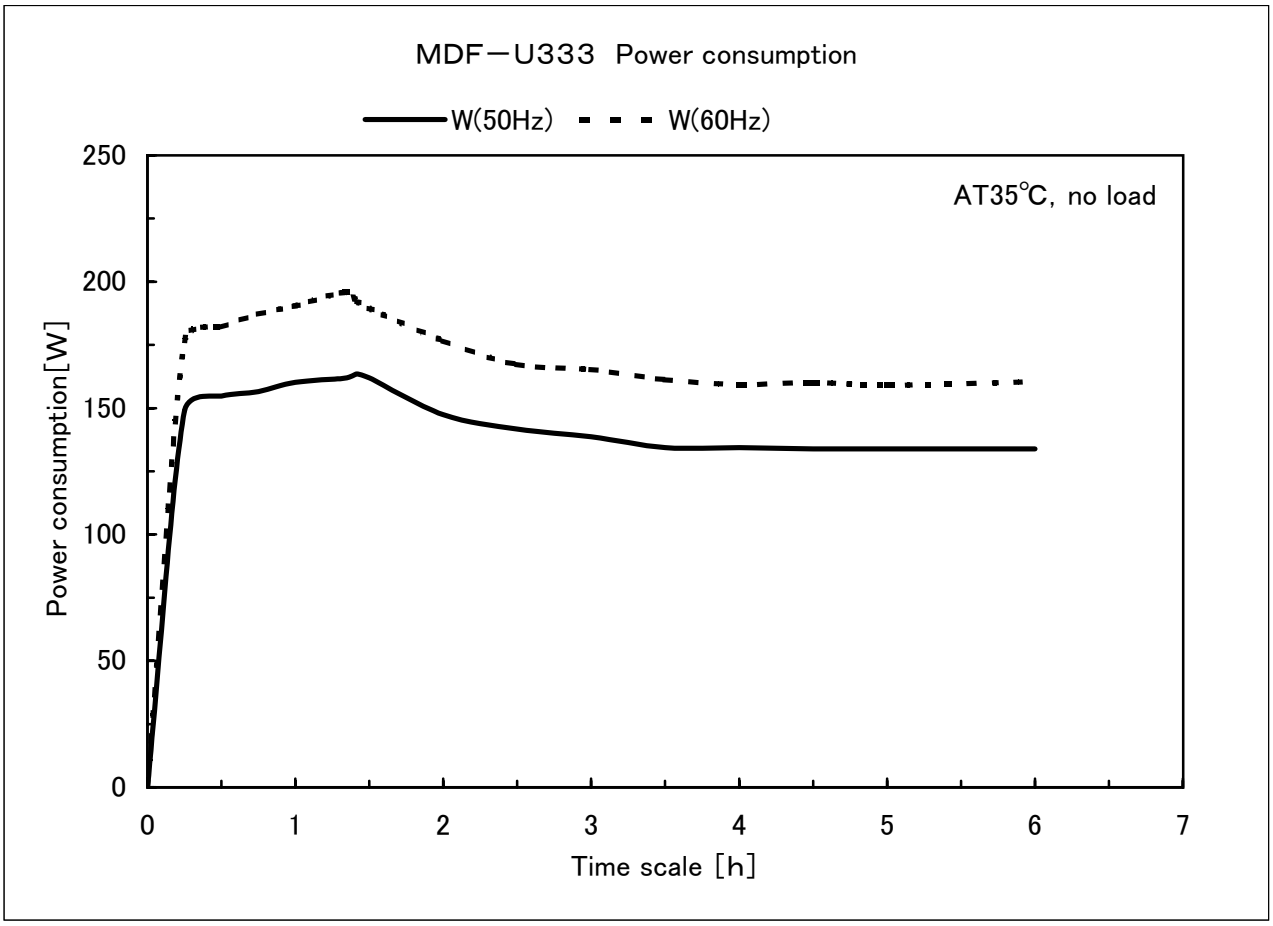
Test data

·MDF－U333 Pull down 40
·MDF－U333 Pull up 40
·MDF－U333 Cooling unit pressure 41
·MDF－U333 Power consumption 41
·MDF－U333 Temperature uniformity and fluctuation 42
·MDF－U537 Pull down 43
·MDF－U537 Pull up 43
·MDF－U537 Cooling unit pressure 44
·MDF－U537 Power consumption 44
·MDF－U537D Pull down 45
·MDF－U537D Pull down 45
·MDF－U537D Pull up 46
·MDF－U537D Cooling unit pressure 47
·MDF－U537D Power consumption 47
·MDF－U537/D Temperature uniformity and fluctuation 48


MDF－U333 Pull down
AT35℃，no load
50Hz
60Hz
Internal temperature [℃]
Time scale [H]
40
30
20
10
0
−10
−20
−30
−40
0
2
4
6
8
10


MDF－U333 Pull up
AT35℃，無負荷
Internal temperature [℃]
Time scale[H]
20
10
0
−10
−20
−30
−40
0
2
4
6
8


MDF－U333 Cooling unit pressure
Pd(50Hz)
Ps(50Hz)
Pd(60Hz)
Ps(60Hz)
AT35℃, no load
Pressure [kPa]
1600
1400
1200
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
Time scale [h]

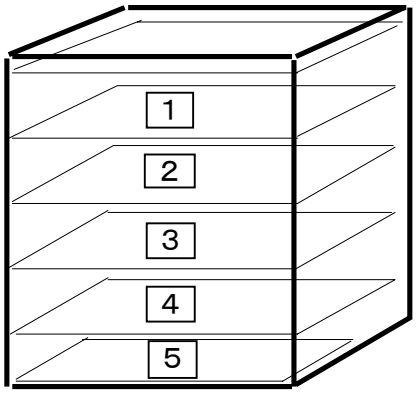

MDF－U333 Power consumption
W(50Hz)
W(60Hz)
AT35℃, no load
Power consumption[W]
250
200
150
100
50
0
0
1
2
3
4
5
6
7
Time scale [h]

MDF－U333

Temperature uniformity and fluctuation

(Test condition)
Mains : 1φ100V50/60Hz
AT : 35℃
SV : -25℃・-20℃・-30℃
No load Measure with type T sensor

Measuring point：Center point of each container



(1). SV＝－25℃

Measuring point		Temperature(℃)	Fluctuation(℃)
Top	1	-21.8	
	2	-23.2	
Middle	3(1/2 center air)	-24.3	± 2.0
	4	-24.6	
Bottom	5	-24.2	
Uniformity	Max./Min	-21.8/-24.6	
	Range(deg)	2.8(±1.4)	

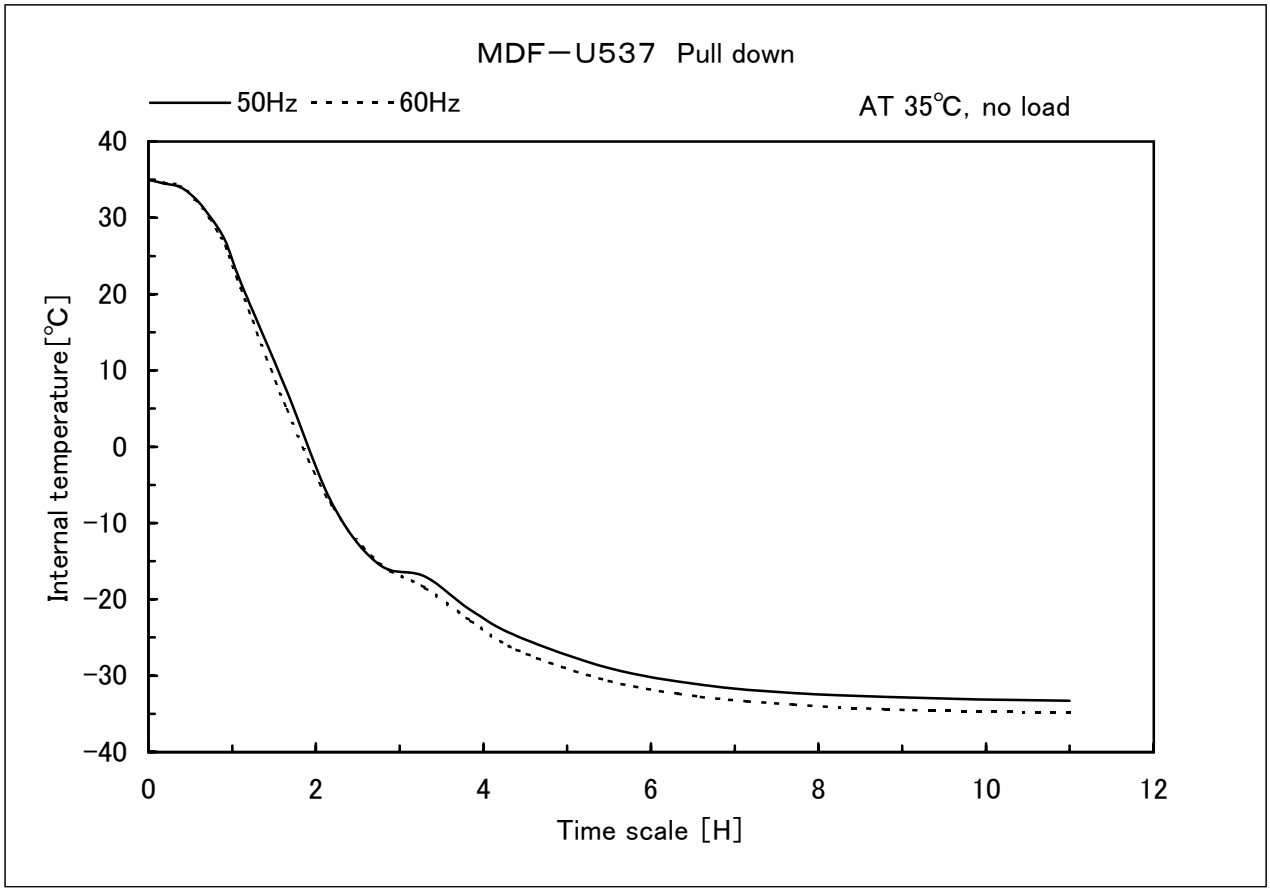
(2). SV＝－20℃

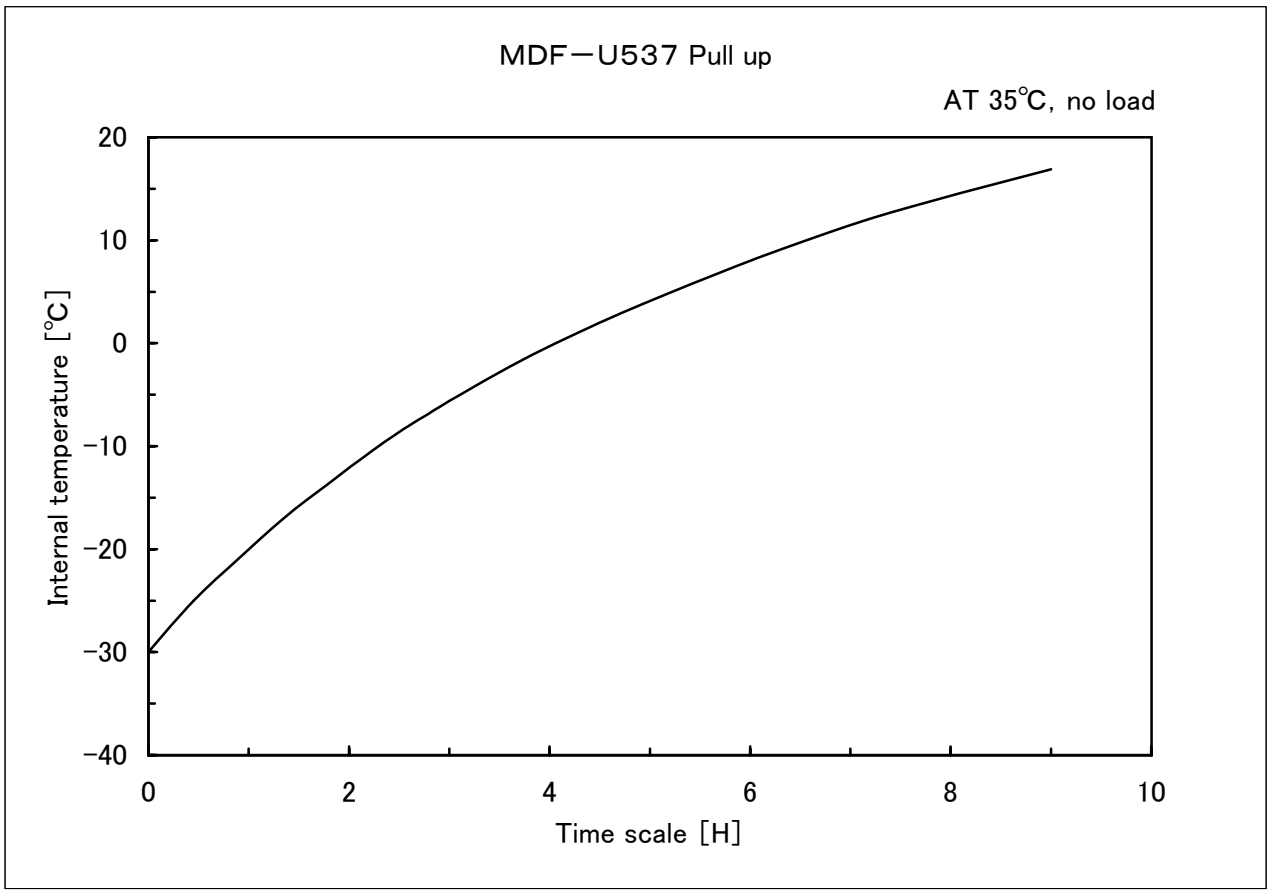
Measuring point		Temperature(℃)	Fluctuation(℃)
Top	1	-17.1	
	2	-18.3	
Middle	3(1/2 center air)	-19.1	± 2.6
	4	-19.4	
Bottom	5	-19.0	
Uniformity	Max./Min	-17.1/-19.4	
	Range(deg)	2.3(±1.15)	

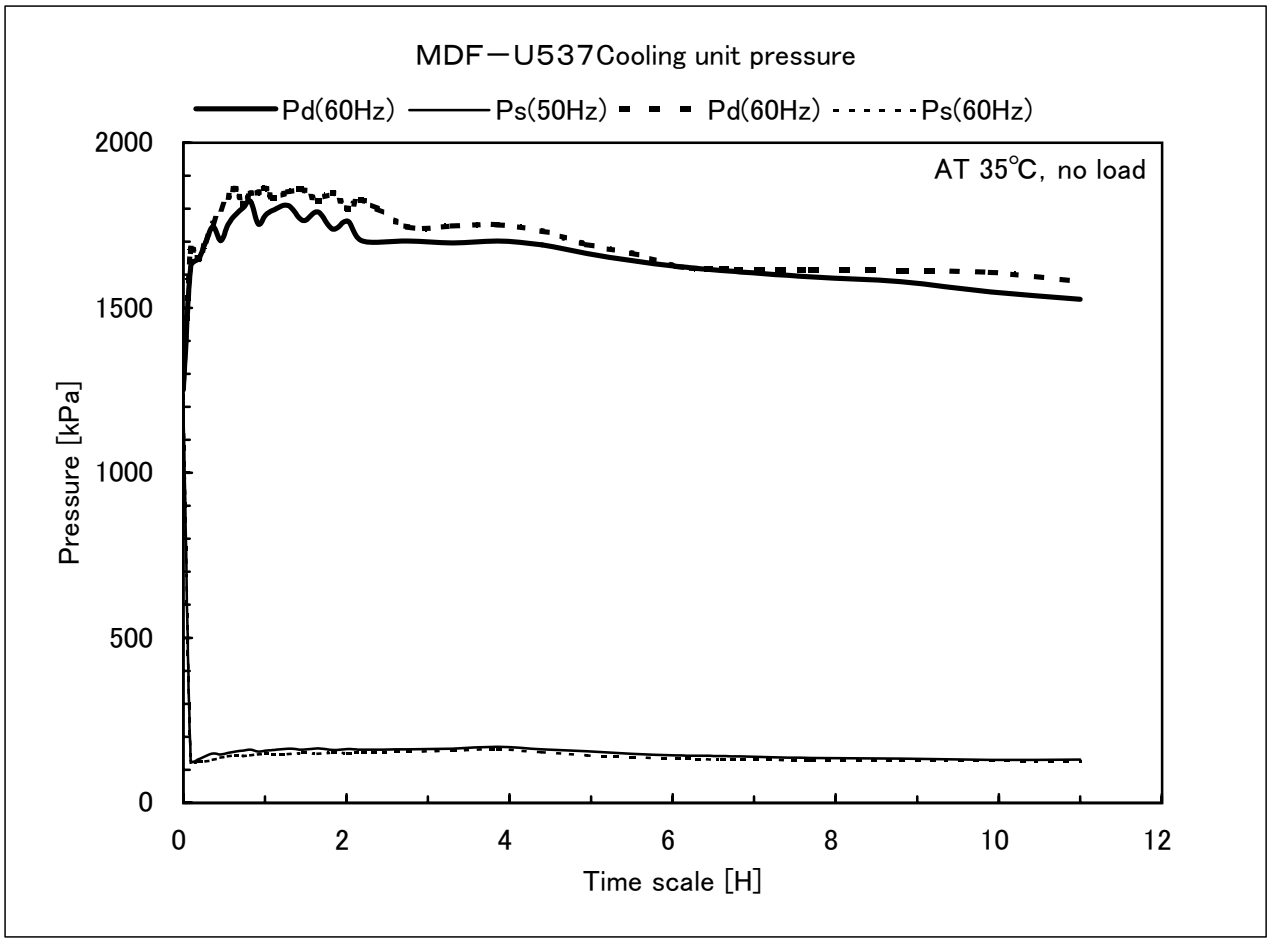
(3). SV＝－30℃

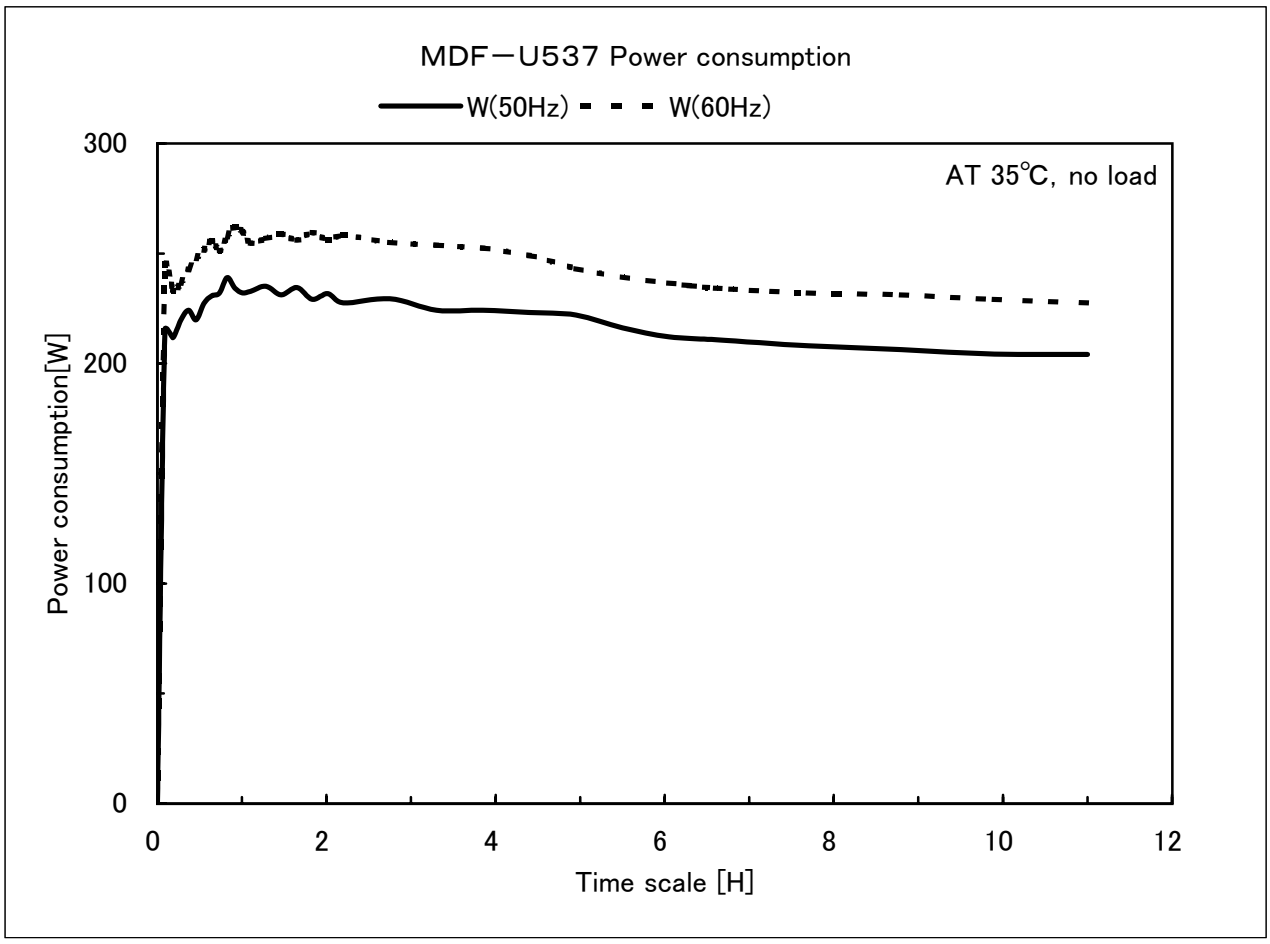
Measuring point		Temperature(℃)	Fluctuation(℃)
Top	1	-26.3	
	2	-28.1	
Middle	3(1/2 center air)	-29.3	± 1.7
	4	-29.4	
Bottom	5	-29.1	
Uniformity	Max./Min	-26.3/-29.4	
	Range(deg)	3.2(±1.6)	

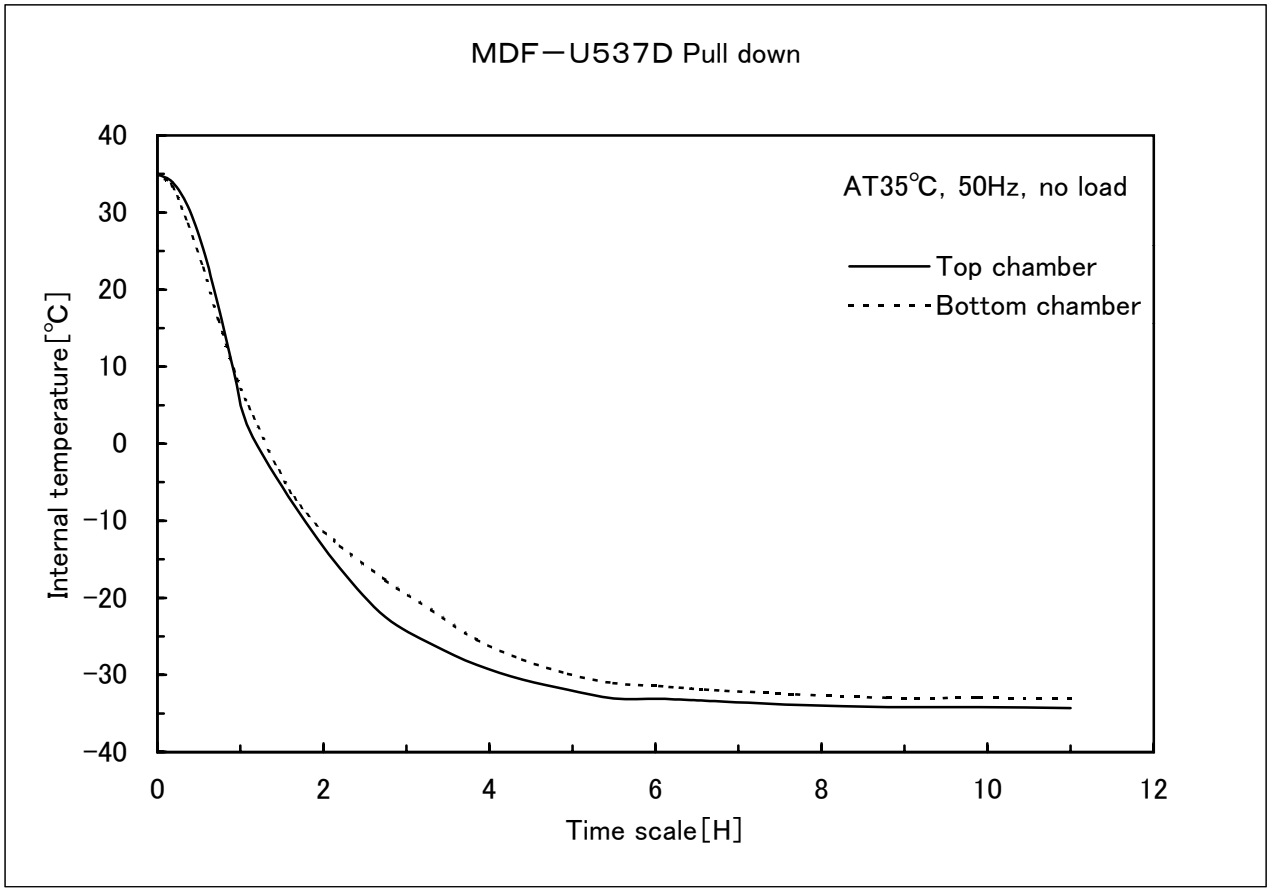
note)These data are reference only.

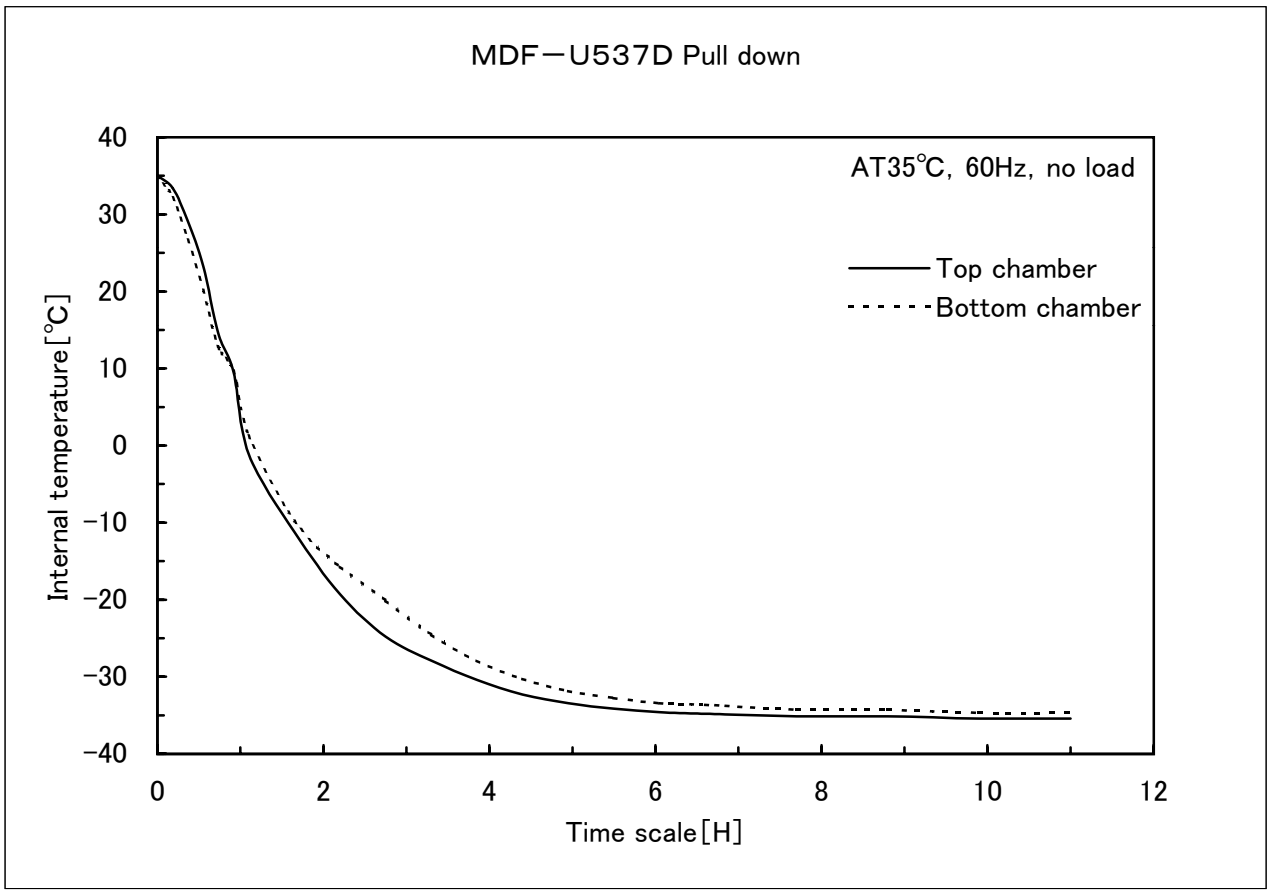

MDF－U537 Pull down
50Hz
60Hz
AT 35℃, no load
Internal temperature [℃]
40
30
20
10
0
−10
−20
−30
−40
0
2
4
6
8
10
12
Time scale [H]

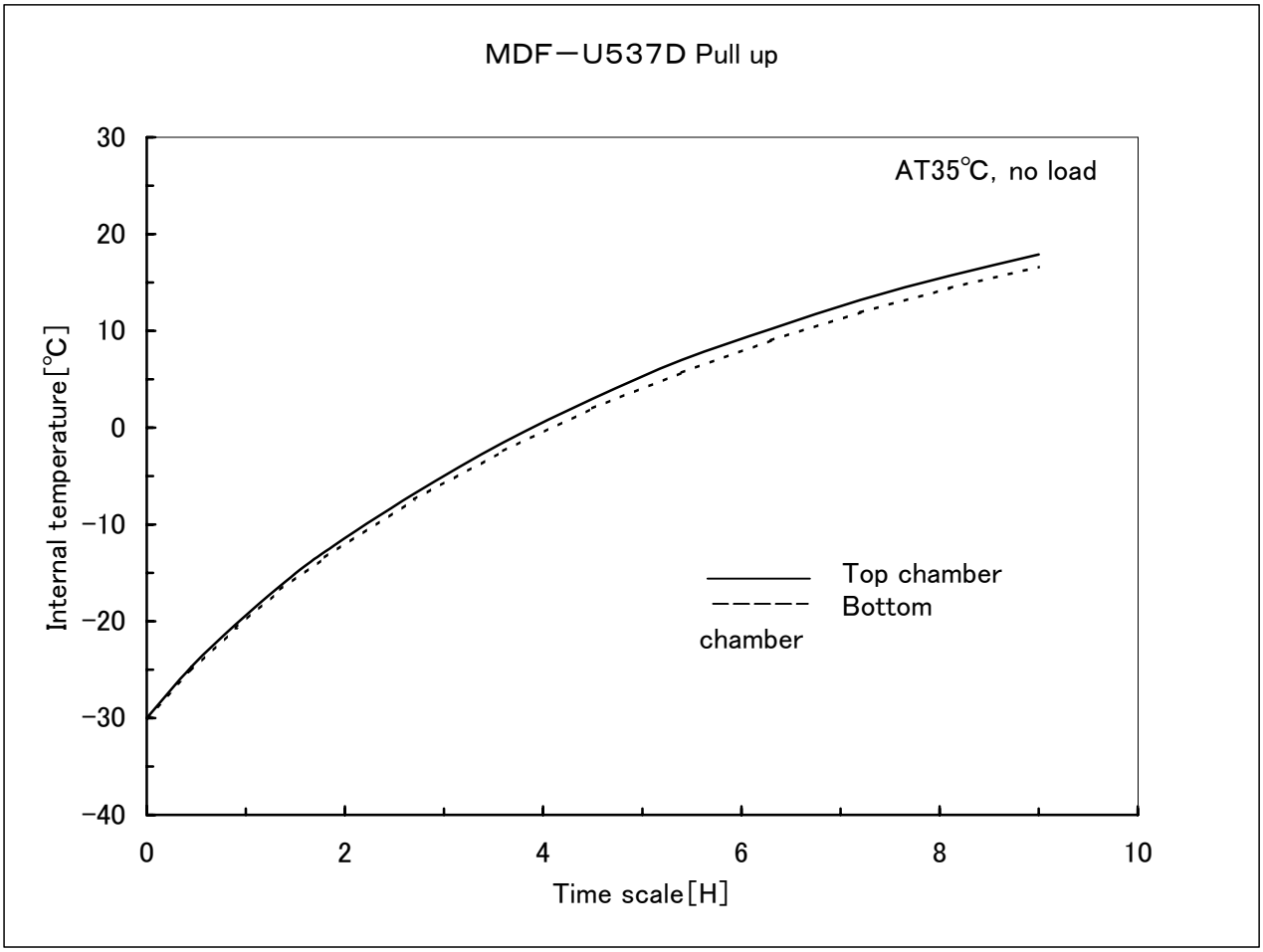

MDF－U537 Pull up
AT 35℃, no load
Internal temperature [℃]
20
10
0
−10
−20
−30
−40
0
2
4
6
8
10
Time scale [H]

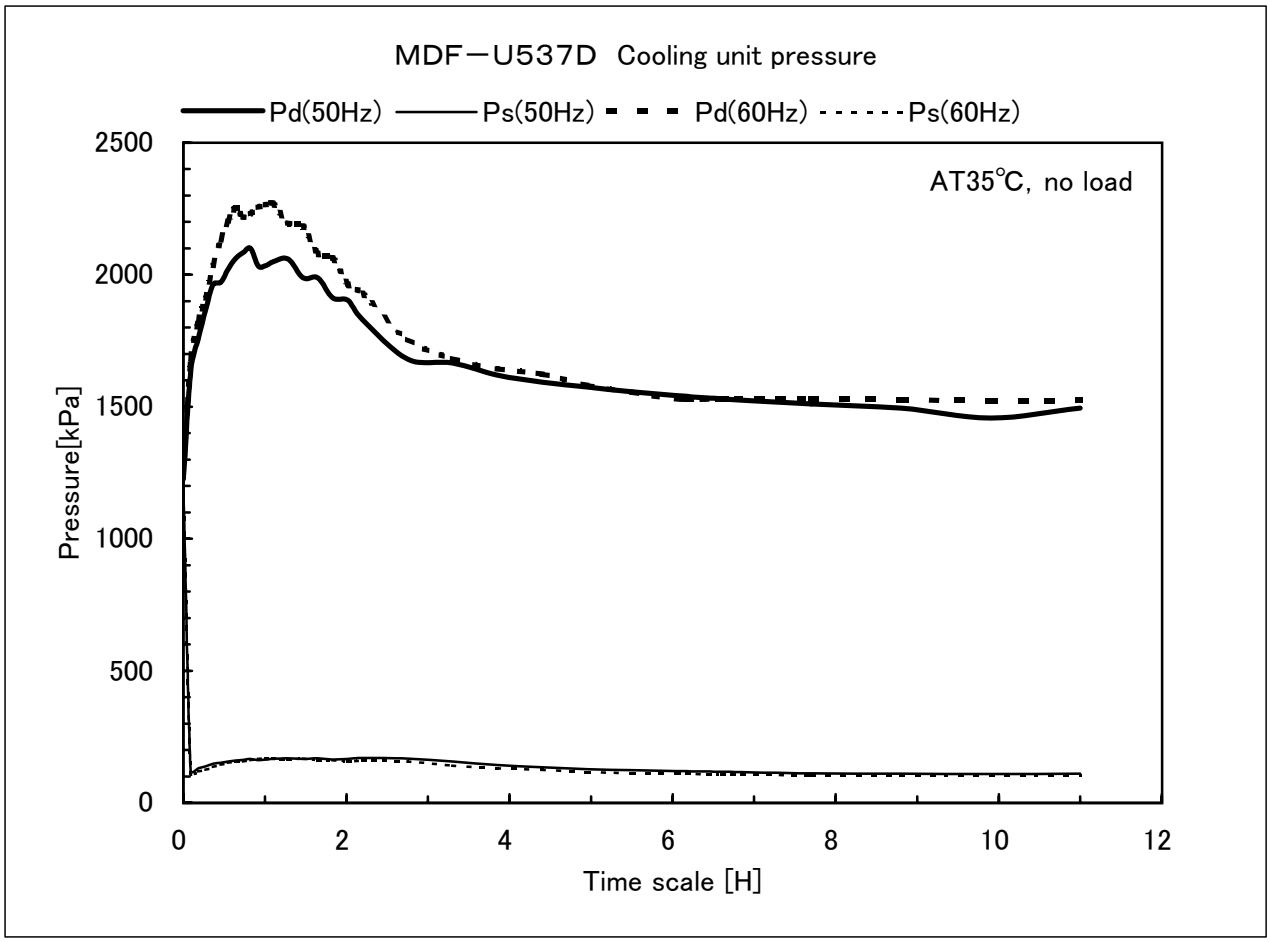

MDF－U537Cooling unit pressure
Pd(60Hz)
Ps(50Hz)
Pd(60Hz)
Ps(60Hz)
AT 35℃, no load
Pressure [kPa]
2000
1500
1000
500
0
0
2
4
6
8
10
12
Time scale [H]

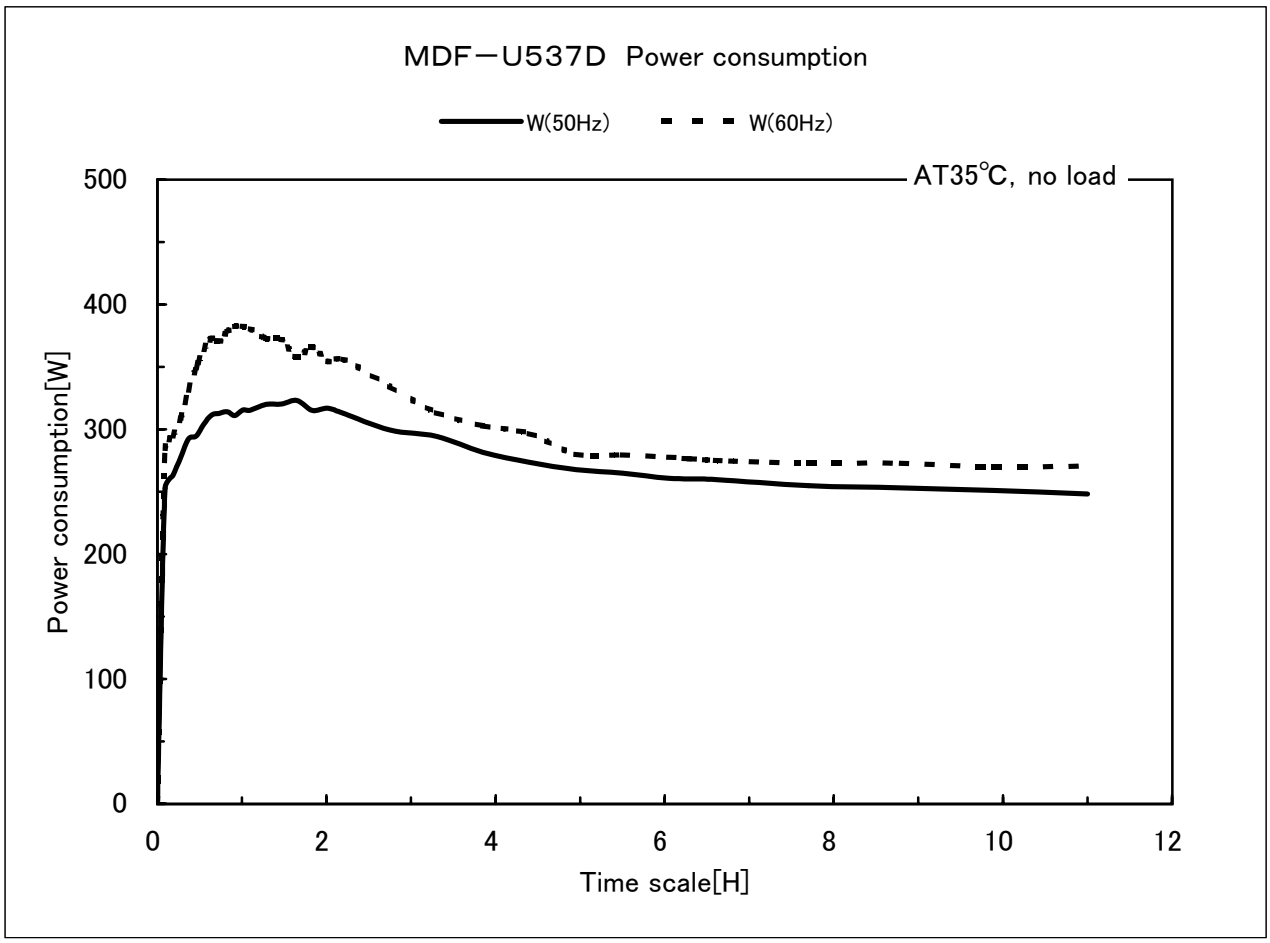

MDF－U537 Power consumption
W(50Hz)
W(60Hz)
AT 35℃, no load
Power consumption[W]
300
200
100
0
0
2
4
6
8
10
12
Time scale [H]


MDF－U537D Pull down
AT35℃, 50Hz, no load
Top chamber
Bottom chamber
Internal temperature[℃]
Time scale[H]
40
30
20
10
0
−10
−20
−30
−40
0
2
4
6
8
10
12


MDF－U537D Pull down
AT35℃, 60Hz, no load
Top chamber
Bottom chamber
Internal temperature[℃]
Time scale[H]
40
30
20
10
0
−10
−20
−30
−40
0
2
4
6
8
10
12


MDF－U537D Pull up
AT35℃, no load
Top chamber
Bottom chamber
Internal temperature[℃]
Time scale[H]
30
20
10
0
−10
−20
−30
−40
0
2
4
6
8
10

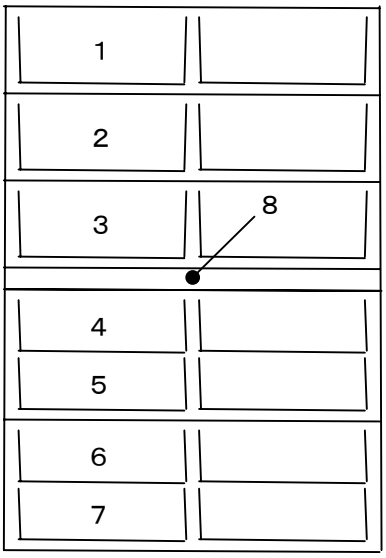

MDF－U537D Cooling unit pressure
Pd(50Hz)
Ps(50Hz)
Pd(60Hz)
Ps(60Hz)
AT35℃, no load
Pressure[kPa]
2500
2000
1500
1000
500
0
0
2
4
6
8
10
12
Time scale [H]


MDF－U537D Power consumption
W(50Hz)
W(60Hz)
AT35℃, no load
Power consumption[W]
500
400
300
200
100
0
0
2
4
6
8
10
12
Time scale[H]

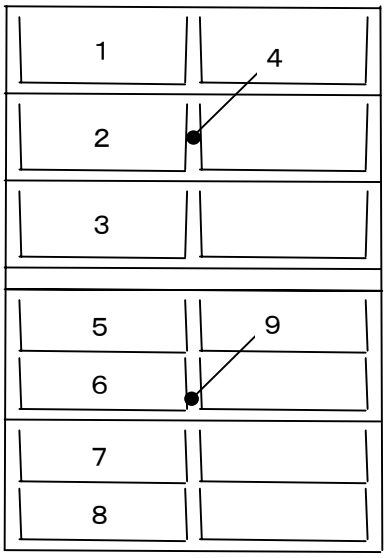
MDF－U537 / D temperature uniformity and fuluctuation

Mains : 100V50Hz
AT : 35℃
SV :−20℃・−25℃・−30℃
No load Mesure with type T sensor
Measureing point : Center point of each container /chamber

MDF-U537



MDF-U537D



《 MDF-U537 》

Measuring point	SV −20℃	SV −25℃	SV −30℃
1	−19.7	−24.6	−30.8
2	−20.9	−25.7	−31.7
3	−21.1	−25.4	−31.7
4	−19.6	−24.7	−29.4
5	−19.9	−24.4	−29.6
6	−21.2	−25.1	−30.7
7	−18.7	−22.8	−27.8
8	−19.9	−24.1	−29.7
Uniformity [deg.]	2.5	2.6	3.9
Fluctuaation[℃]	±2.0	±1.4	±1.5

《 MDF-U537D 》

Measuring point	SV −20℃	SV −25℃	SV −30℃
1	−17.7	−22.4	−27.4
2	−19.9	−25.1	−30.1
3	−18.8	−24.9	−30.8
4	−19.8	−24.9	−30.2
Uniformity [deg.]	2.2	2.7	3.4
Fluctuaation[℃]	±3.1	±2.1	±0.9
5	−22.4	−25.8	−29.8
6	−21.3	−25.3	−29.5
7	−20.5	−25.8	−30.4
8	−17.9	−23.3	−28.1
9	−21.7	−26.2	−30.4
Uniformity [deg.]	4.5	2.5	2.3
Fluctuaation[℃]	±3.2	±2.6	±1.3

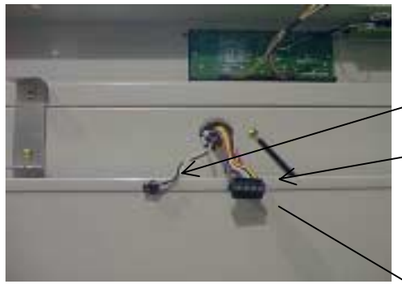
note)These data are reference only

＜Memorandum＞

Parts layout

MDF−U537

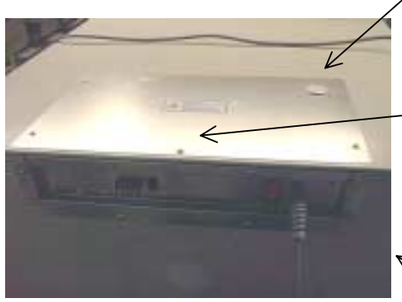
Inside of control panel



Connecter for buzzer

Connecter for display P.C.B.

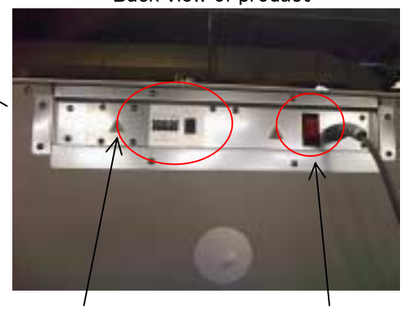
Top view of product



Access port for recorder wires

Electrical parts on top

Back view of product



Remote alarm terminal

Breaker switch

Door latch

Inner parts
of door latch

・Temperature control sensor (MDF-U537)
・Temperature control sensor
for upper chamber (MDF-U537D)

・Solenoid valve control sensor (MDF-U537)
・Temperature control sensor
for lower chamber (MDF-U537D)

Connecter for tenperature recorder power sourece